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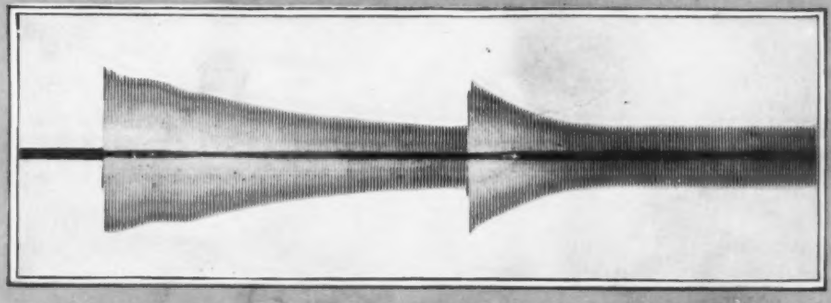
Electrical World

McGraw-Hill Company, Inc. New York, April 15, 1922 Twenty-five Cents a Copy

THE STARTING CURRENT OF

Century

AUTOMATIC START INDUCTION
POLYPHASE MOTORS



Oscillogram showing relative current values over a period of 2.95 seconds, of a 10 hp., 220 volt, 1725 r.p.m., 3 phase, 60 cycle "AS" motor starting and operating under full load.
The N.E.L.A. starting current rule permits a locked rotor current of 120 amperes or a starting current of 90 amperes when measured with a well-damped ammeter.

CANNOT be varied by the attendant. A single throw switch is used for starting. The fuses used for running protection are sufficient for starting, and small enough to protect against an interruption of one phase of the supply system.

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TEMPERATURE RISE NOT MORE THAN 40° C.

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USE

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Electrical World

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The Curse of Secrecy

WHY does the old idea of secrecy linger so long with —not all—but many central-station managers? We have utility commissions today, which is obvious recognition of the fact that the public has a right to say how the light and power service shall be run. We are eagerly selling securities to customers, because we want the people to know more about utilities and take an understanding interest in them. It is no longer possible to make a private business out of a central station. And yet some utility executives still perch on the lid, hugging their elbows, trying to hide the details of this work that their communities are paying them to do.

THERE was a time when no employee of a utility was allowed to tell anything to press or people. Everybody was muzzled but the manager, and he would not talk. The affairs of the company were nobody's business. All questioners were looked on with suspicion. "Pussyfoot" was the word. The slogan of the company was "Silence!" But, thank Heaven, times have changed.

Not long ago a newspaper reporter in Pueblo, Col., got the idea of taking a job as a meter reader for the Arkansas Valley Railway, Light & Power Company to get an inside picture of the public utility and its service to the people. He told the manager and was welcomed in. He read meters for weeks and all the time wrote human-interest stories of what the utility meant to the community. It was literally worth millions to the company and almost as much to the town. It won thousands of friends.

THERE is nothing to hide about the utility business. Many stockholders own it. The people regulate it. The people have a natural interest and they want to know about it. So, why not tell the world continually the whole appealing, creditable story of the present practices and progress of this great, growing industry? Why not talk freely to the press? Why not make it easy for any citizen to get the facts? Why not disarm the politician by giving the people knowledge and appreciation of the facts as they occur before any pirate can build up false accusations?

In theory the industry believes all this. In many cities it is well in practice. But across the land this curse of secrecy dies hard. And so we still find central-station executives who refuse to talk, men who neglect to give a free and full account of this, their stewardship, to the communities for which they work. Why, even when contributing experience to their own industry, they suppress their company and community names as though they were afraid. Yet there is far more safety in honest frankness than in the biggest gag that ever blocked the mouth of man.

Waldo Calvin Bryant

Pioneer electrical manufacturer and inventor, who has championed "quality production" for over three decades

WHETHER justly or not, American industry is sometimes criticised for undue emphasis upon "quantity production." As the demand for a commodity increases, the temptation to sacrifice quality to securing minimum cost is often very alluring. Had the electrical manufacturer succumbed to that lure progress would have been materially curtailed. Quality products, especially in the wiring-device field, mean not only efficient but safe equipment. When one sees some of the material that is sold in other countries it is apparent that the American electrical industry is fortunate in having as its manufacturers men like W. C. Bryant, president of the Bryant Electric Company, who have always taken a firm stand for high-grade output.

Mr. Bryant typifies those who saw from the outset that a great manufacturing industry could be created, built and sustained by applying scientific knowledge and business integrity to the fabrication and marketing of high-class technical products, and that the behavior of these products even in the smallest units under service conditions would be the measure of success. He was born at Winchendon, Mass., Dec. 17, 1863, and received the degree of B.S. in mechanical engineering in 1884 from the Worcester Polytechnic Institute. He immediately entered the "expert department" of the Thomson-Houston Electric Company at Lynn, Mass., and was soon transferred to Bridgeport and later to Waterbury, Conn., as assistant operator of the local electric lighting plant. Following his invention of the Bryant push-and-pull switch, in 1888, Mr. Bryant returned to Bridgeport and began the manufacture of electric lighting supplies under the name of the Bryant Electric Company. He patented various electrical devices used in distribution work and in 1889 incorporated the company with a capital stock of $5,000. From this small beginning the business has grown under his presidency to a capitalization of $2,000,000.

The first president of the Electrical Manufacturers' Club, Mr. Bryant has constantly been actively interested in the economic problems of the industry. He is a member of the American Institute of Electrical Engineers and a valued adviser in many banking and industrial and philanthropic organizations. During the world war he was district chief of ordnance for the War Department, in charge of munitions production in Connecticut and western Massachusetts.

Editorial Comment

Electrical World, April 15, 1922

Volume 79 Number 15

To Picture Foreign Trade Opportunity

AMERICAN manufacturers are interested in foreign trade, but as a generation we lack experience. Time was when the Yankee windjammer touched at every port and prospered. We were a seafaring people then in so far as our coast states were concerned. But our attention has long been absorbed in industrial development and providing for our own fast-growing population. Now new conditions focus more thought on the world's markets, and the possession of many ships impels us to traffic with the foreigner.

The situation appeals particularly to our industry, because it is with the products of our ingenuity that we, as a people, have won greatest success in selling across the seas. American labor-saving machinery has won its way against all competition, and the mass production of such distinctly American devices offers great opportunity to the manufacturer of electrical equipment and appliances. There is need, therefore, for information on these distant lands and intelligent advice as to what to sell and where to sell it. There being a lack of general experience, we need to take such knowledge as we have from individual contacts and disseminate the facts shared for the common good.

In this issue there appears the first of a series of articles on the market prospects for American electrical products in different quarters of the globe written by men who speak out of the fullness of broad personal experience. There is interesting opportunity in Latin America and in Spain. There is a waiting market in other European ports. There is profitable trade for us in the Far East. They will tell of it. And this more accurate knowledge of the conditions that exist among these far-off peoples, what they need and why, and how it can best be carried to them and sold, is information that should be valuable to more than the exporting manufacturer alone. It will bring a picture of the broader economic outlook for our industry that with the closer contact of international affairs is going to be a growing influence and in a greater or less degree to affect us all.

More Figures Wanted on Distribution Costs

THE recent publication by the Electrical Supply Jobbers' Association of summarized cost figures based on a six months' check in five jobbing houses has raised a cry for more figures on electrical distribution costs and more detailed information as to what these figures really mean. It is good to know the total "selling cost," but it is better yet to know how much is spent for advertising, salesmen's salaries, salesmen's expense and general traveling expense. "Operating expense" is interesting, but it is more useful to see what is charged to office supplies and expense, taxes, insurance, heat, light and water; to officers' salaries, office salaries, postage and stationery, telephone and telegraph charges; to freight and drayage, packing and shipping-room expenses.

In September, 1921, the volume of business done by the electrical jobbing industry, we understand, was about the same as in September, 1917. But the cost of doing that amount of business had just about doubled. These are conditions that cannot be mocked. They must be met with practical measures for the reduction of expense, so that the cost will bear the right relation to the volume. For the electrical business will not prosper until its goods are being distributed freely and prosperously by the individual distributers. The first step toward this is for the jobber to study his own costs and the other fellow's costs by such detailed comparisons as may be possible. A more explicit presentation of the component elements in the association's summary of costs will, therefore, be extremely helpful.

What Will Be the Outcome of the Radio Fad?

"WHERE is the dealer going to 'get off' in the radio game?" is the important question that many dealers and central-station men are asking at the present moment. Some of the manufacturers are beginning to ask the same question. Right now radio is a fad. So were the automobile, the bicycle, the sewing machine and a host of other things that are now classed as necessities in community life. Every important invention that brings apparatus into common use in the home and the store goes through this stage. However, radio has this important difference, that with only the home workbench and a few parts purchased from the dealer any ordinarily intelligent individual can put together at least a receiving set that will give satisfactory results. Sometimes even transmitting sets can be assembled. In addition, radio operation carries a fascination that is equaled by few other comparable hobbies.

There is no question that entertainment broadcasting has created the existing tremendous interest in radio, but its use has by no means been confined to the reception of amusement programs. Prior to this service government bureaus sent out market reports by radio. This was followed by the transmission by enterprising agricultural schools or state universities of material of tremendous value to the farmers. Sooner or later the existing fad may subside, but meanwhile radio is weaving itself into the fabric of business and home life in a way that will make it as much of a necessity as some of the older developments have become.

In the meantime the business man who is supplying the demand for equipment can well carry in mind the experience met in the development of some of the older businesses. Wild buying and still wilder commitments to heavy future financial obligations in the effort to

obtain material to sell are a sure road to ultimate failure. The prudent man will buy carefully, will avoid overstocking and, above all, will keep fancy-free and foot-loose so that as the period of stabilization develops he will not have an unnecessary burden to carry. The best opinion available seems to indicate a belief that the present rush will continue through the next year at least, but that all manufacturers and dealers should proceed with caution until the business has settled down to a normal gait.

It is well to make hay while the sun shines, but be sure that the hay is not caught in the rain and ruined later on.

Italian Experience in Railway Electrification

IN VIEW of the consideration that is being given to railway electrification in connection with proposed superpower systems, it does not seem amiss to direct attention to what has actually been accomplished on the Italian State Railroads. They have been second to none in progressiveness. The interesting experimental feature of their work is that two distinct methods of traction have been tried out simultaneously, one a third-rail system at 650 volts, the other a three-phase system at 15 cycles and 3,000 volts deriving its current from two overhead wires while the track served as a third. During twenty years of operation both systems have given continuously a good account of themselves. But it is to be noted that the increase that has taken place is almost wholly upon the three-phase system, the total amount of track electrified being close to 800 miles, of which less than 80 miles is direct current.

Of course, very many American engineers will cite at least a dozen theoretical and practical reasons why three-phase traction must of necessity prove a failure, but the Italian experience of a score of years utters point-blank denial, particularly since one of the roads concerned, crossing the Apennines from the port of Genoa, is the most heavily laden of all of the Italian state railroads. Seventeen lines in all have now been electrified, not including privately owned lines aggregating something like 400 miles of track.

The saving of coal accomplished by bringing hydroelectric plants into service will run to nearly 400,000 tons annually by the end of the present year, and when the present electrification program of 2,800 miles is completed the saving accomplished will be nearly half of the total consumption of coal for railway purposes. Without comment on the systems employed or on how they might be improved, it may be asserted that every engineer who has given the Italian systems personal examination realizes that their entire operation is successful. The work in Switzerland and on the Swedish state railways goes also to demonstrate the same undeniable fact. There has been no failure recorded with any system which has been seriously tried.

Here, as in Italy and Switzerland, electric traction has proved successful to such extent as it has been tried in regular railway service, but the saving in fuel expense effected thereby is not so great as in Continental Europe owing to the great difference in price of coal here and there. The whole question as far as American railways goes turns upon their ability under existing conditions to sustain the weight of equipment bonds necessary to carry out electrification.

Selling the People Our Great Public Works

WE ARE living in an era of great engineering projects, in which developments are carried out that affect large and widespread populations having the most limited and perfunctory knowledge of the cost, value and purpose of the enterprise. The people of the South are concerned in the Muscle Shoals controversy because of the human-interest aspects of its war history, its promise of fertilizer for the farmer and the spectacular association with it of the name of Henry Ford. But it is safe to say that the real import of this project to the people of many cities and large towns scattered across a group of states is but little appreciated.

A recent full-page advertisement in the newspapers of Boston, signed "Boosters of New England," is an interesting example of the kind of good work that can and should be done in such a case to aid in carrying to people who, though they are concerned, are so remote from the scene of the project that they are not individually interested, as are those nearer at hand, through the natural reaction that comes with a personal contact and a knowledge of the plans. This advertisement presents in a most forceful manner the reasons why New England will be directly benefited by the St. Lawrence Canal project. It points out the inevitable influence that this great improved facility for transportation from the Middle West to the Atlantic will have upon the cost of shipping vital necessities into the New England States and the stimulating impulse that will come to all New England industries from such a quickening of trade. It calls upon the New England people to get behind the St. Lawrence project for the promotion of the united prosperity of the country. It meets each argument that has been raised against it by the partisans of Boston with a clear, informing statement of unquestionable facts.

Public education of this kind increases the public interest in public works and public service. It teaches the man on the street to think in terms of larger public opportunities and obligations. It gives him a keener understanding and a broader sense of justice in his judgment of his own local utilities. It is a work in which the central-station company should engage whenever the public interest in such an issue presents the occasion for contributing information for the common good.

Research Section Starting Its Sixth Year

WITH the page of "Scientific and Industrial Research" printed in this issue we start on the sixth year of this somewhat unusual section of our paper. Begun in March, 1917, at the height of the war excitement and preparedness talk, it has appeared regularly in the third issue of each month, furnishing information on research in progress or completed and containing suggestions for research to be undertaken. It may be said without exaggeration that hundreds of items have been briefly mentioned which otherwise would have never seen the light of publicity. To all those who have made this section possible by contributing items the sincere thanks of the profession and of the editors are due.

But the problem is only begun. However valuable the individual items may be, the real progress of the art demands their proper co-ordination and dissemination

among those interested. The National Research Council, the Engineering Foundation, the American Institute of Electrical Engineers, the Physical Society—all these agencies look after the interests of electrical research in their respective fields. It has been our aim to co-operate with them as well as with the Bureau of Standards and with large laboratories maintained by industrial organizations and by colleges.

However paradoxical it may seem, such a co-ordination of research in a given branch of electrical engineering depends more upon the existence of a "school of thought" than upon any of the formal committees, sub-committees, bulletins, conferences, reports and the rest of the machinery for which we Americans have such an admirable aptitude. When a "school of thought" undertook vigorously to defend Faraday's ideas against the theory of electric action at a distance, or the principle of the armature counter-mmf. against the leakage reactance idea, or the cutting theory of induced emf. against that of change in flux, all important research bearing upon these ideas became quickly co-ordinated, large groups of people became interested in it, and the most important problems for future investigators became quite clear.

So with present-day research will greatest strides be made if "schools of thought" are promptly formed and extended in centers of industrial activity and scientific research.

Wireless Lights—Interesting if True

BEARING in mind the successive steps in the development of present-day electric lighting sources, showing as it has noteworthy and even sensational advances in successive stages, and remembering the relatively low luminous efficiencies of the best of these sources, it appears practically a certainty that still further improvement or new discovery will follow. Certainly no one would be rash enough to deny this possibility. Consequently this field not only offers promise to the sincere investigator, but provides a plausible opportunity for unscrupulous claimants of new discoveries, serving as bait to the credulous victim ostensibly allowed in on the ground floor. Improvements when they come may be expected in the form of new incandescent filaments and better types of luminous gas discharge, with the remote possibility of some hitherto unrecognized method of obtaining a high luminous efficiency in the phosphorescent or fluorescent field. Consequently fake claims usually masquerade as new types of filament, cold light, the wireless lamp, or other sensational suggestion taken from the field of known opportunity.

But completely revolutionary advances rarely, if ever, occur, and the most remarkable are generally announced through recognized channels of authentic information to the profession concerned. These advances are always found to rest on sound scientific principles, applied more widely, or perhaps on new materials, and their authors invite inspection, criticism and approval. For only in this way can a new device or method obtain adoption.

Therefore all new claims of remarkable discovery, whether in the lighting or other field, should be received with an attitude of "interesting if true," but should be viewed with the utmost suspicion if they are shrouded in mystery or surrounded by guards. Credence should be placed in and support given to them only when a complete explanation of the working method is forthcoming and endorsed by a competent expert.

Isolation of Disturbances the Tendency in Station Protection

THE concentration of large amounts of power in single stations is forcing careful consideration of means not only for the protection of service but also to insure that in the event of troubles the effect on apparatus and station wiring can be so localized that serious damage and interruption to service will not occur. The problem has got far beyond being one of insulation alone. In the event of an insulation breakdown the resulting arc, either to ground or between phases, can because of the concentration of power do a tremendous amount of damage to the apparatus and structures in the immediate vicinity. One of the outstanding features of the designs of the year, the segregation of bus phases, has been worked out to meet this problem. It is a feature of the new Calumet plant design in Chicago and of the Hell Gate plant in New York City. The use of reactors in this connection has the same aim. One of the larger plants in the country, which was originally laid out without any general use of reactors and with no provision for their use, is rearranging circuits and finding room for reactors as a means toward protecting plant and service.

The house turbine for handling all auxiliary service is another protective move that has been discussed rather intensively for several years. It seems to be increasing in favor. The question that has to be answered before it can be considered as a standard of good practice in the larger plants is whether the protection to service that it affords is worth the cost. The use of storage batteries with automatic throwover devices to protect exciter service in the large power plant falls in the same category. Some discussions being waged seem to hinge on the question whether the troubles due to the presence of resistance are not worse than those prevented. Time and thought are being put on this subject by several association committees representing several branches of the industry. All of the developments outlined need the careful attention of the men who design large plants.

Yourself—Applied as Capital

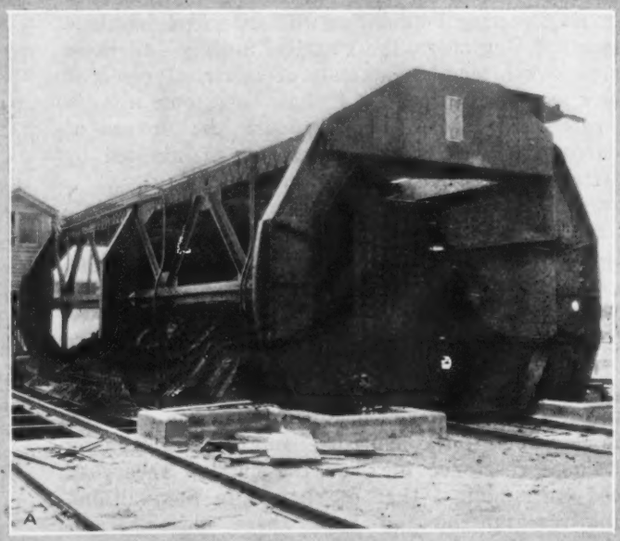
THE runaway slave in "Huckleberry Finn" prided himself tremendously on his cash value. "The widow" had threatened to sell him for a hundred dollars. He had himself. So he was rich. And, after all, this is a pretty good and practical point of view.

A man who earns $2,000 a year represents to himself a capital of $50,000 at 4 per cent. A four-thousand-dollar man can set himself down as having a personal valuation of $100,000. A man who earns $10,000 annually is a capital asset of a quarter of a million—all figured at this ratio. And such a man may well inquire of himself how wisely he has invested and applied this capital and what provision he is making for its permanent security.

There is a great deal more to any job than the day's work—particularly in such a business as ours. There is a great industrial progress to be guided, a vital service to mankind to be expanded and accelerated. In it are engaged a vast army of men and women with a potential capacity for achievement past all calculation. We are elements in this great resource and opportunity each one of us. The point is—how much of this capital do *you* represent and how well are you applying it?

Handling Fuel in Milwaukee Pulverized Coal Plant

THE conveyance of coal and its treatment preparatory to combustion in the boiler furnaces are two functions in which the Lakeside generating station of the Milwaukee Electric Railway & Light Company differs from the usual run of power plants. The details are given on the following pages, but some of the coal-handling apparatus is shown here. For example, A shows a rotary car dumper discharging into a track hopper from which the coal is carried over magnetic separators to the two-roll crusher and grizzly shown in B. The fuel then goes through the hammer mill D and is carried to the green-coal bunkers in the pulverizing plant by conveyor C. After pulverizing and drying the coal is fed into the furnaces E by screw conveyors.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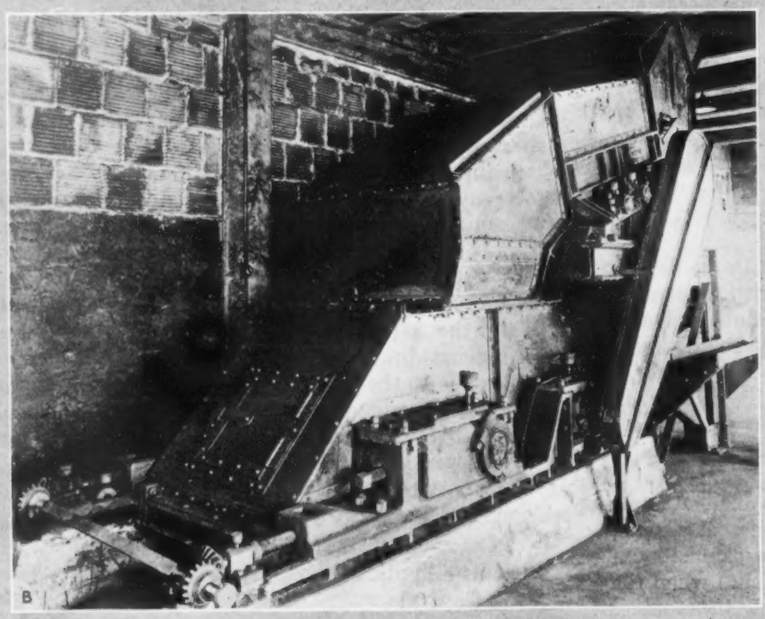
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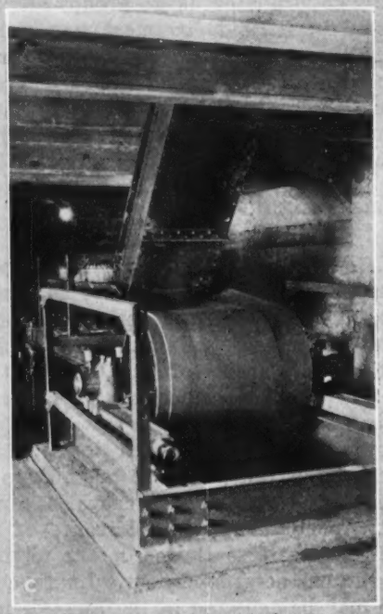
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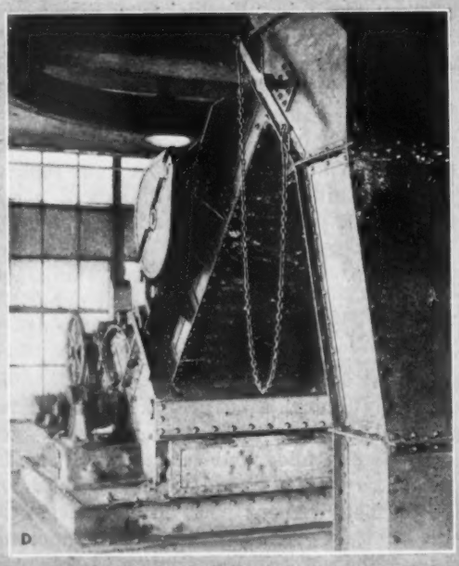
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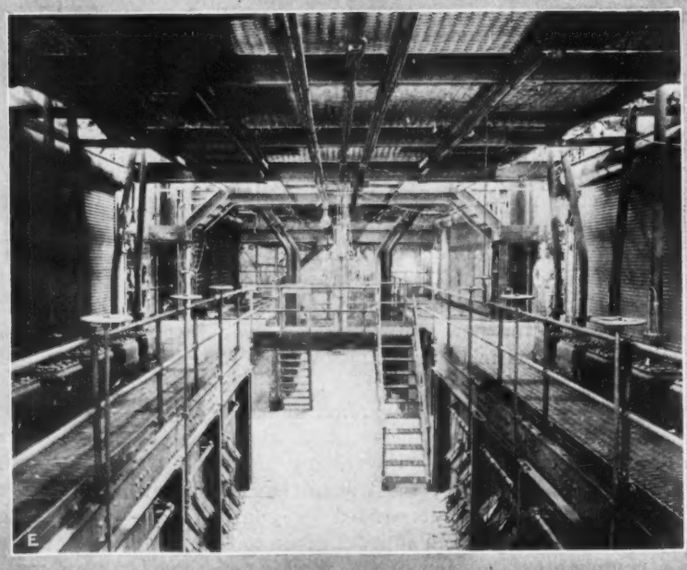

E

First Large Plant Using Pulverized Coal Exclusively

Lakeside Generating Station of Milwaukee Electric Railway & Light Company Designed for Initial Capacity of 40,000 Kva., with Ultimate Rating of 200,000 Kva.—Central Control and Minimum of Attendance

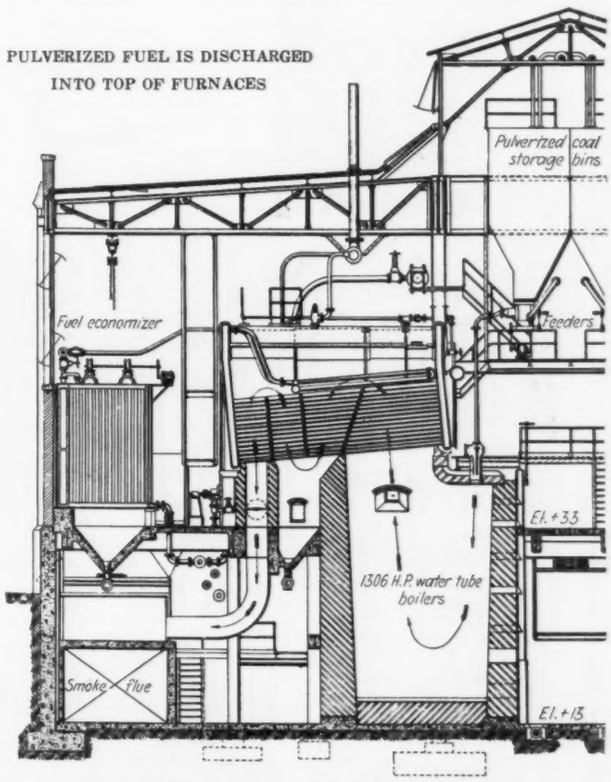
THE outstanding feature of the Lakeside generating station of the Milwaukee Electric Railway & Light Company is that it is the largest central station designed for using powdered coal exclusively. In addition, the circulating-water system, which takes its supply from Lake Michigan, had to be designed to operate through all kinds of weather, and this meant to meet the conditions caused not only by ice and ordinary storms, but also by the great lake storms that approach ocean tempests in their severity. To protect the intake against these conditions a rubble mound was built into the lake and the inclosure connected with the condenser piping by tunnels.

The plant was first projected in 1916, when the site at the southern boundary of Milwaukee on the shore of Lake Michigan was purchased; but, although excavation was started, the war then raging made it impossible to proceed with the construction at that time. Work was not recommenced until Jan. 21, 1920, and then the plans had to be revised to make arrangements for handling coal shipped by rail from the Illinois fields in place of the original plan to use fuel shipped from the Eastern fields by water. Consequently the harbor and dock plans were abandoned, although they remain a remote future possibility. Changes in plans were also influenced by the experiments which had been conducted with pulverized coal at the Oneida Street plant in Milwaukee.

To remove the coal from the cars a rotary car dumper is employed which drops the contents of the car into a track hopper fitted with bottom shaker feeders. From these hoppers belt conveyors carry the coal over a magnetic pulley which removes any iron which is present. Then the fuel is passed through a two-roll crusher and hammer mill, from which it is discharged onto belts that carry it to the distributing belts over the green-coal bunkers in the pulverizing plant. Three of these belts are provided, each having a traveling tripper which may be set to discharge the coal at any desired point. The crushers have a capacity of 150 tons of mine-run coal per hour and the belt conveyors a capacity of 250 tons per hour at a speed of 250 ft. (76 m.) a minute. When future needs require it, the coal can be bypassed around the crusher and conveyed to the storage dock, where it will be handled by a coal-handling bridge.

For pulverizing, eight mills with a capacity of 6 tons an hour each are provided. The coal is delivered from them in such condition that 75 per cent of it will pass through a 200-mesh screen and 90 per cent through a 100-mesh screen. Each mill is provided with a fan for separating the pulverized particles that have been reduced to the desired fineness. These particles are discharged into cyclone separators, where the fuel is separated from the air and allowed to fall into a screw conveyor which conveys the fuel to the pulverized-fuel storage bins. From these it is taken by the conveying system to the fuel bins in the boiler room.

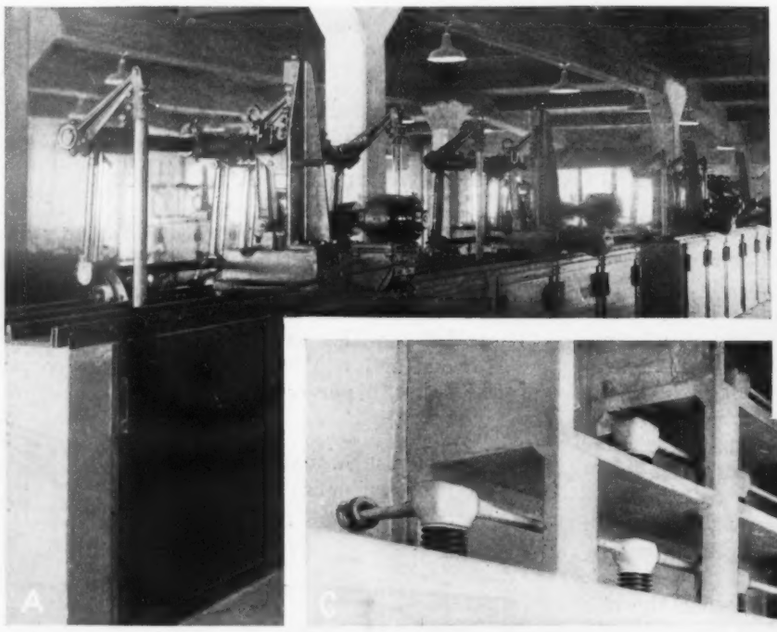
Three driers with a capacity of 10 tons an hour each are provided and will reduce the moisture content of the coal from 10 per cent to 2 per cent. Screw conveyors carry the coal so dried to bucket conveyors, which in turn deliver it to another system of screw conveyors for transferring to the dried-coal bins over the pulverizing mills.

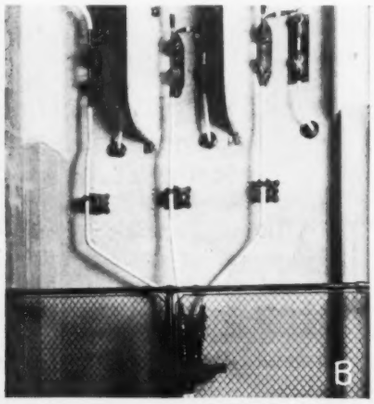


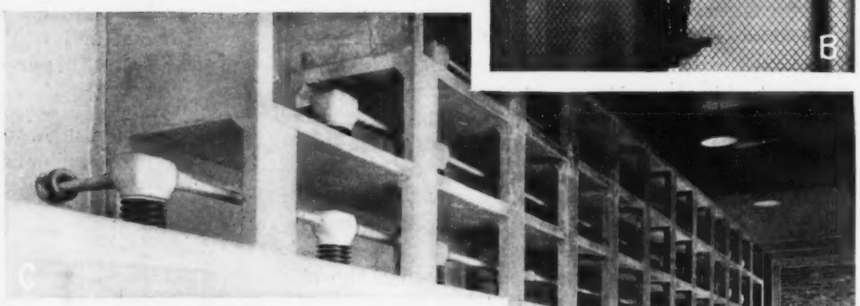
The green-coal bunker into which the coal is first discharged by the belt conveyor from the unloading hopper is in the pulverizing plant. It has a capacity of 3,400 tons, or slightly more than three and one-half days' supply for maximum operation of all the boilers in this section of the plant. From this bunker the coal is taken by three screw conveyors, which deliver it to automatic scales. These in turn take it to another set of screw conveyors feeding into the driers. This arrangement permits the use of any one of the three driers and also makes it possible to check the coal accurately as it is used.

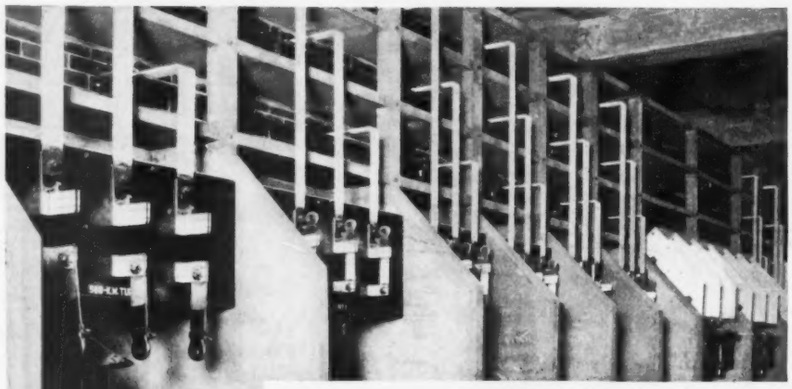
Coal is fed into the furnaces by screw conveyors from the storage bins overhead. Eight 1,306-hp. boilers designed for 300 lb. pressure (21 kg. per sq.cm.) are

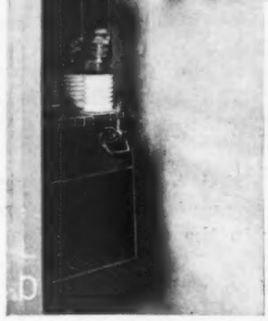
Some Departures from Usual Practice in Electrical Construction

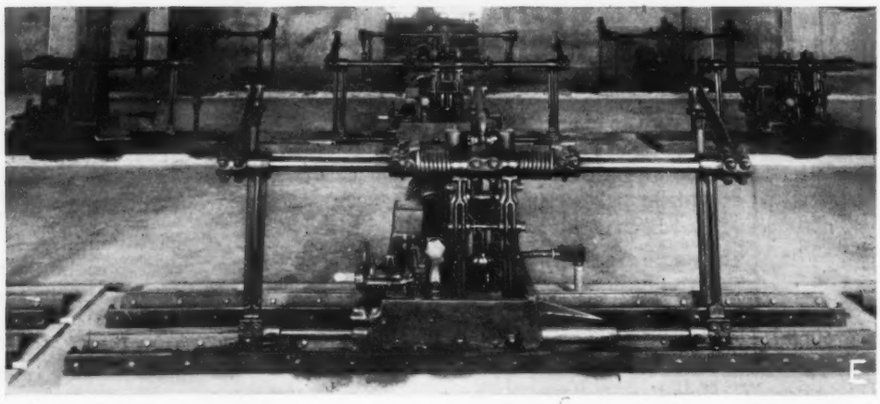






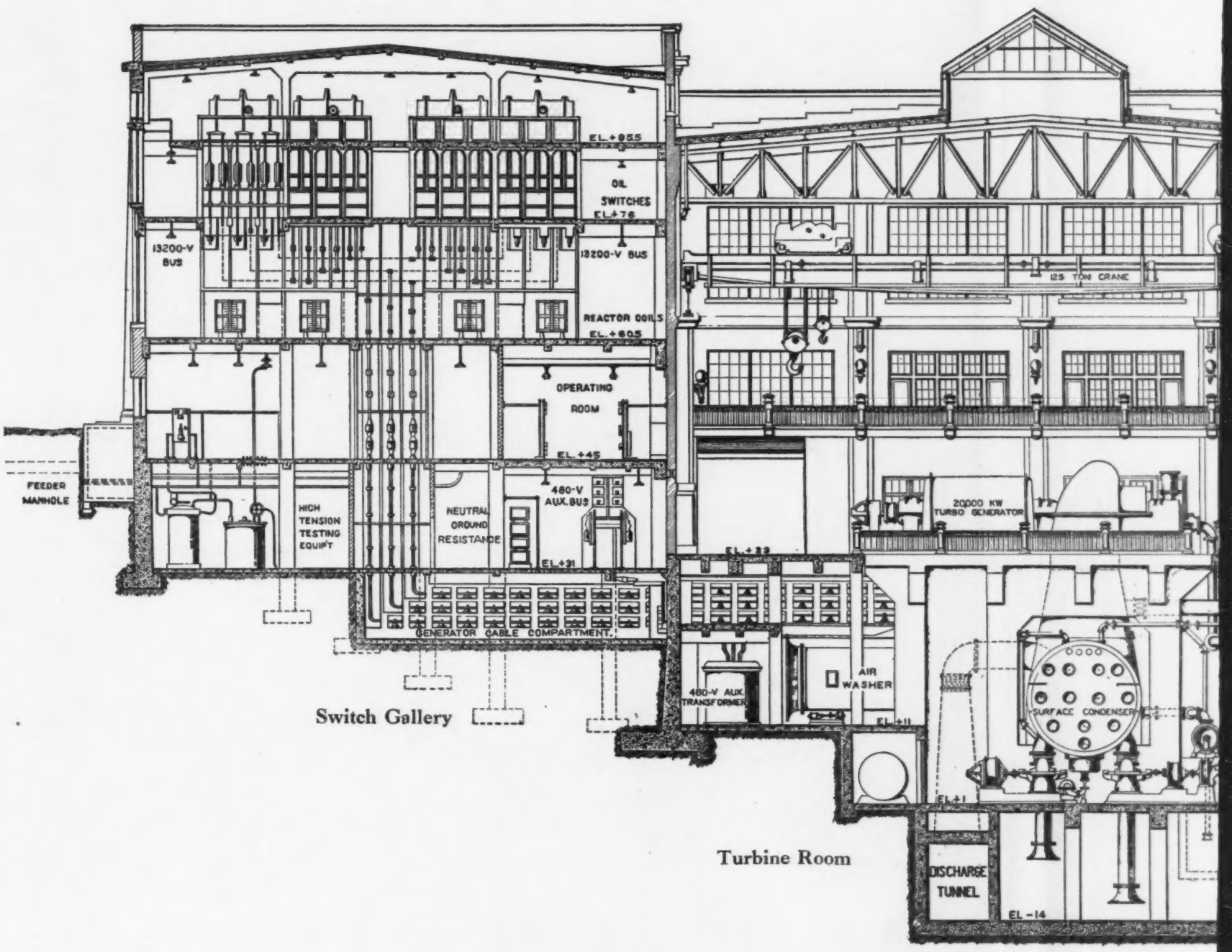






IN some ways the layout and construction of the electrical section of the Lakeside generating station of the Milwaukee Electric Railway & Light Company depart from the usual arrangements found in power plants. Some of the differences are illustrated: A and E show circuit-breaker operating mechanisms mounted for convenient inspection and maintenance. B indicates the methods of connecting outgoing feeders with underground cables and surge arresters, the devices to the right of the "disconnects" being fuses. C is a feeder bus, all parts of which are insulated and protected by a flame-proof covering. D is a section of the 480-volt auxiliary-service switch structure with leads also carefully protected.

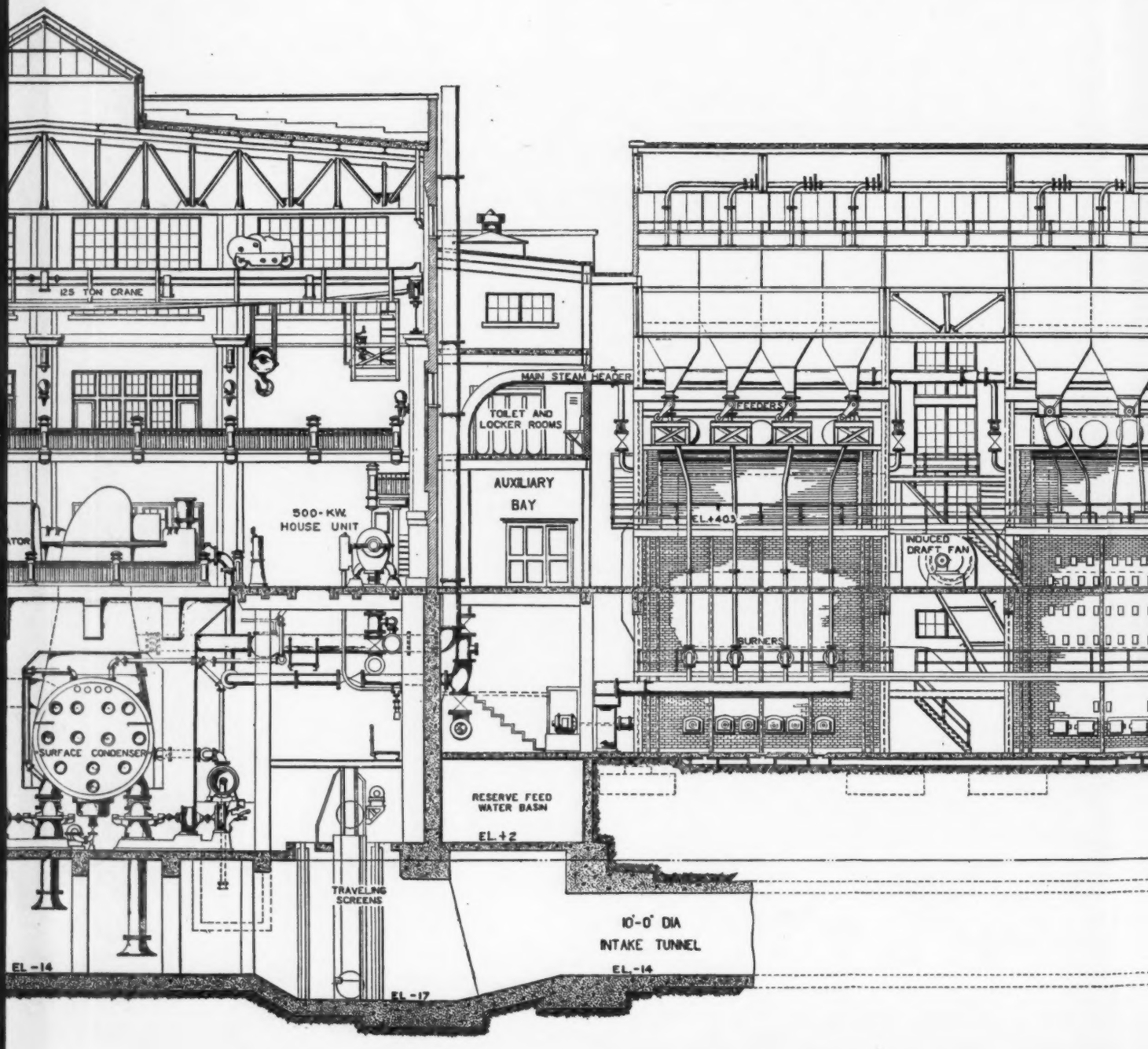
Briefly, there are two main buses in the station with sectionalizing switches between generator sections. Generators may be connected to either bus by selector switches. The feeders are connected in groups of three to feeder-group buses which may likewise be connected with either main bus. The circuit breakers are on one floor and their operating mechanisms on the floor above as shown in A and E. To isolate disturbances, the generator circuit breakers are separated by three or four feeder circuit breakers; the group circuit breakers are also separated by being placed at each end of a section. All 13,200-volt conductors are taped with varnished cambric and protected by flame-proof covering. Main busbars are separated by gypsum barriers.


EL.+955
OIL SWITCHES EL.+76
13200-V BUS
13200-V BUS
REACTOR COILS EL.+605
OPERATING ROOM
EL.+45
FEEDER MANHOLE
HIGH TENSION TESTING EQUIPT
NEUTRAL GROUND RESISTANCE
480-V AUX. BUS
EL.+31
GENERATOR CABLE COMPARTMENT
Switch Gallery
125 TON CRANE
20000 KW TURBO GENERATOR
EL.+33
480-V AUX. TRANSFORMER
AIR WASHER
SURFACE CONDENSER
EL.+11
EL.+1
DISCHARGE TUNNEL
EL.-14
Turbine Room

Lakesid

Milwaukee E

Operated Excl



side Generating Station

of the

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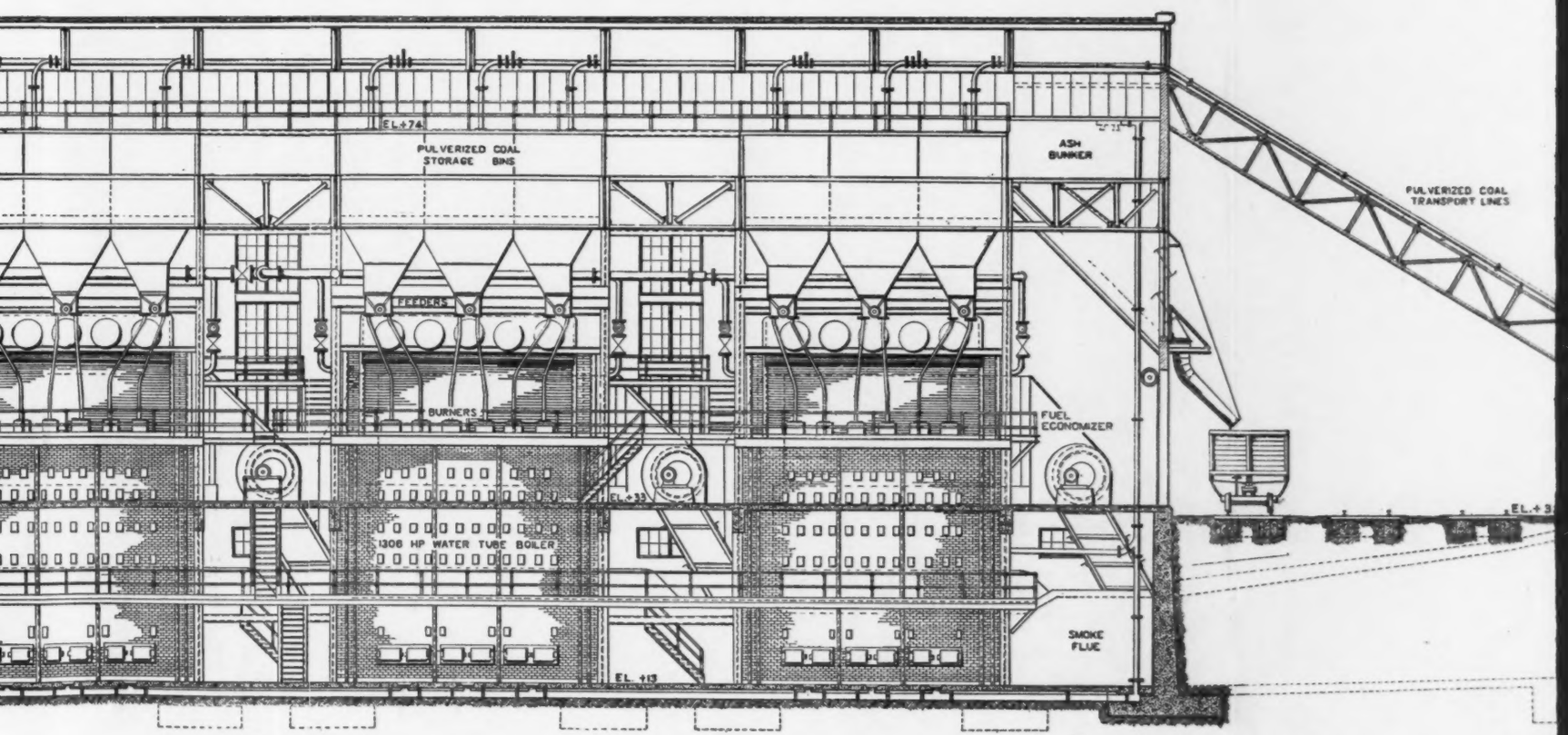
xclusively by Pulverized Coal

Initial Rating, 40,000 Kw.
Ultimate Rating, 200,000 Kw.



Boiler Room

NORMAL LAKE LEVEL - EL.0

LONGITUDINAL SECTION OF PLANT

Generating Station

of the

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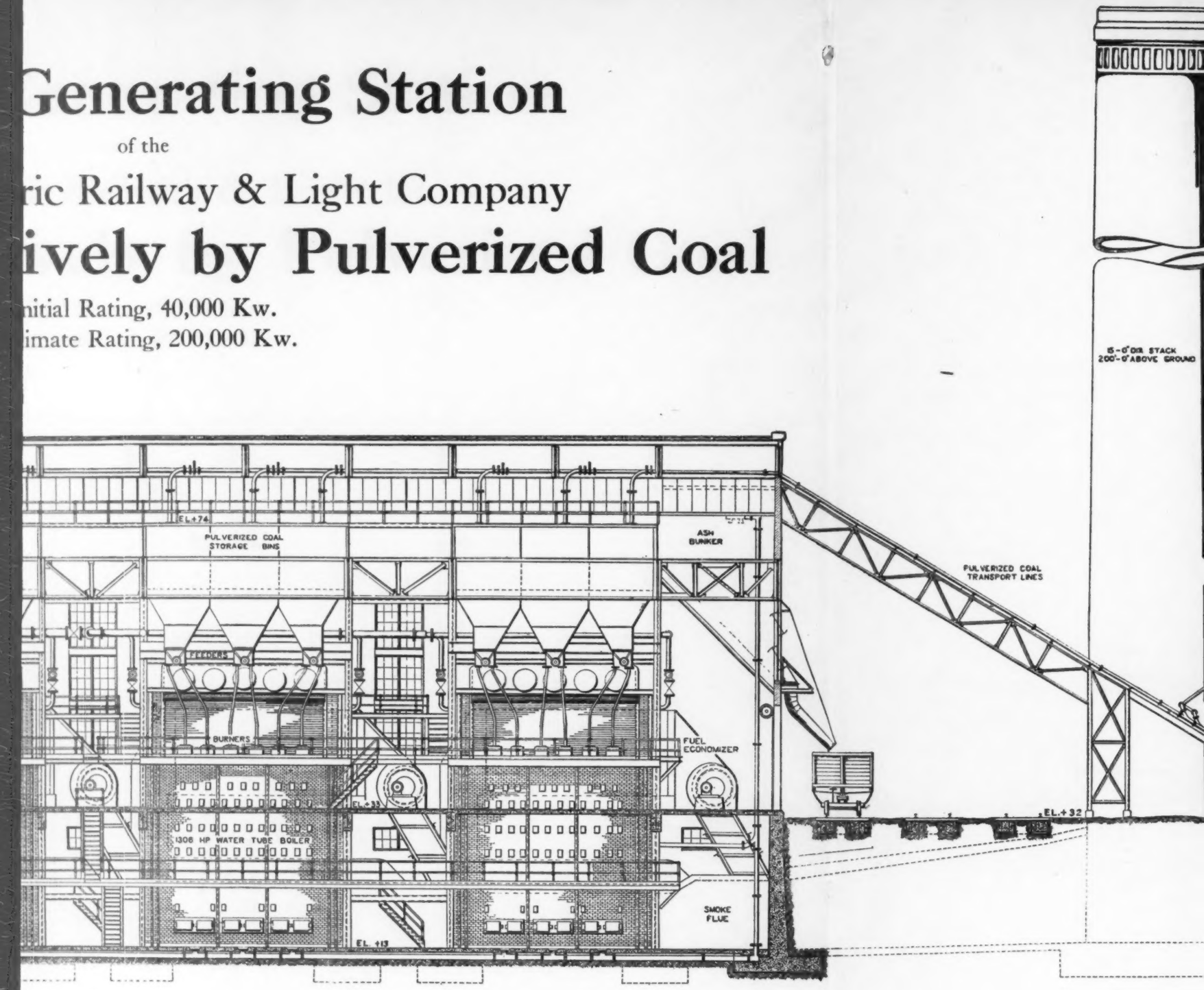
ively by Pulverized Coal

nitial Rating, 40,000 Kw.

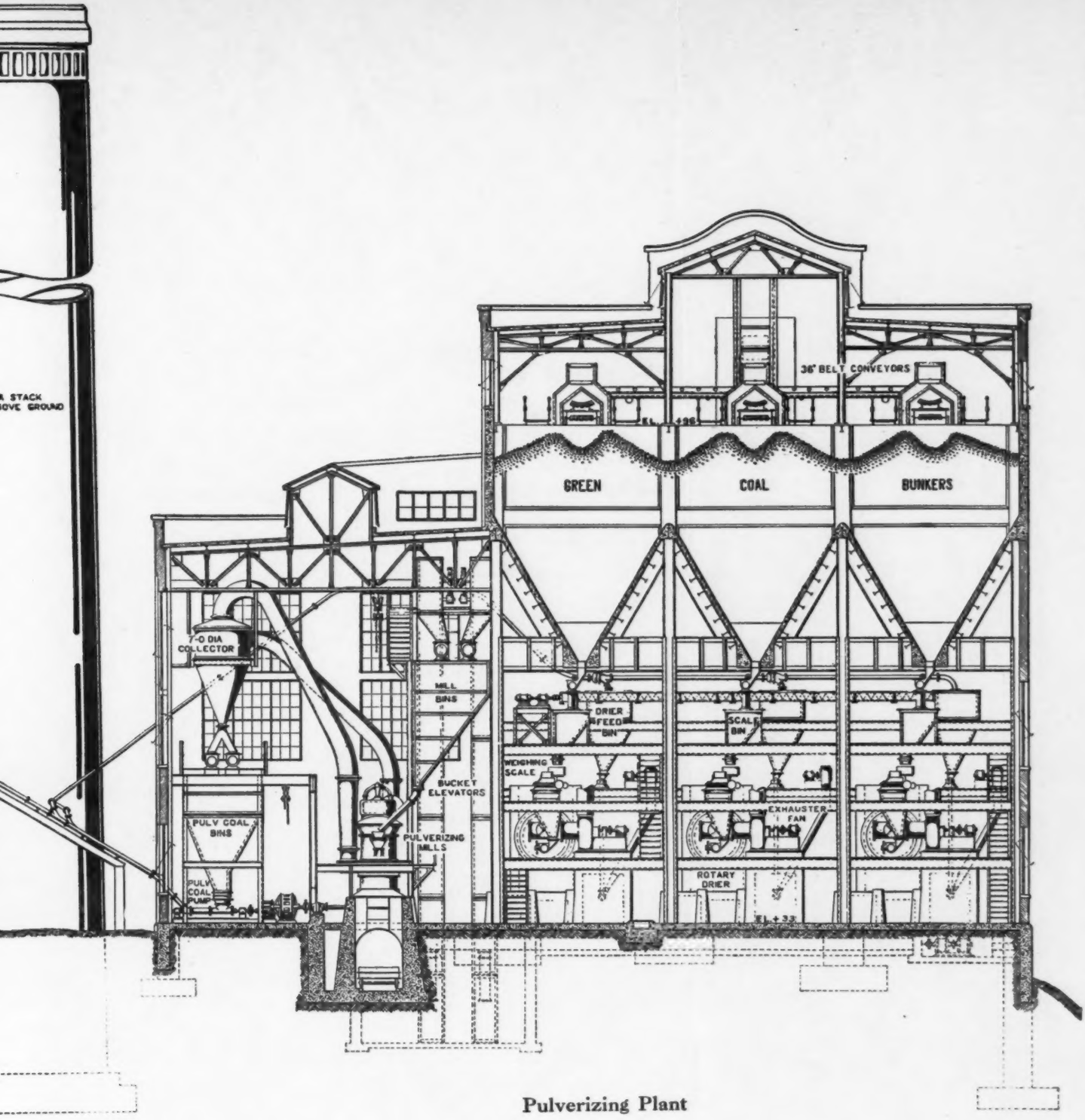
imate Rating, 200,000 Kw.



Boiler Room

NORMAL LAKE LEVEL - EL.0

NGITUDINAL SECTION OF PLANT



Pulverizing Plant

installed. They are arranged in two rows, four boilers per row. At 250 per cent rating, which will normally be employed, three boilers are sufficient to furnish steam for one 20,000-kw. turbine, leaving two spare boilers for the two turbines now installed. Each boiler has a superheater capable of increasing the temperature of 90,000 lb. (40,800 kg.) of steam per hour from 411 deg. Fahr. (211 deg. C.) to 611 deg. Fahr. (322 deg. C.) and an economizer having 7,603 sq.ft. (716 sq.m.) of heating surface arranged with bypass connection to the stack. The induced-draft fans are driven by steam turbines. Water is received by the economizers at 140 deg. Fahr. (66 deg. C.) and is delivered to the boilers at 255 deg. Fahr. (124 deg. C.).

Condensate from the turbine condensers is pumped to an overhead hot well and fed by gravity to two heaters which raise the temperature of the feed water from 80 deg. Fahr. (27 deg. C.) to 140 deg. Fahr. (60 deg. C.). A reserve basin below the boiler-room floor is connected with the heaters by centrifugal pumps which deliver water to the heaters as needed. From the heaters the water passes by gravity through a V-notch meter so placed as to give a 15-ft. (4.5-m.) suction head on the boiler-feed pumps. A header capable of being connected with the condensate pumps on any condenser discharges into a separate V-notch meter so that tests can be easily conducted. The feed-water pump installation consists of two centrifugal pumps operated at 650 gal. (2,460 l.) per minute and two pumps operated at 400 gal. (1,514 l.) per minute, both motor-driven. Since the eight boilers at 250 per cent rating require 1,450 gal. (5,489 l.) per minute, two motor-driven pumps or one steam-driven pump can be retained as spare equipment.

STEAM-JET ASH CONVEYORS

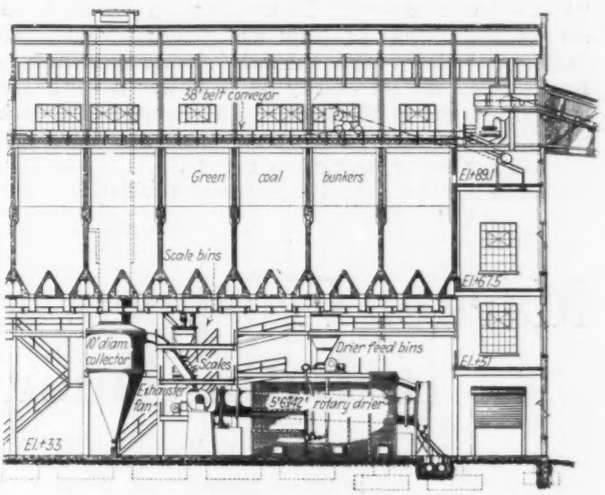
The quantity of ash is very small and is handled by means of steam-jet ash conveyors. The conveyor mains connect with the ash pits, and branches lead to the combustion chambers and soot pits. The conveyor discharges into an ash bunker and thence through spouts into railroad cars.

Two 20,000-kw., 13,200-volt, three-phase, turbine generators operating on 250 lb. (17.5 kg.) steam pressure are installed. Each unit is equipped with a 35,000-sq.ft. (3,253-sq.m.) three-pass condenser, two circulating-water pumps (one motor-driven and one driven by a steam turbine), one motor-driven condensate pump, one motor-driven turbo air pump and a steam-jet air pump. Both of the circulating-water pumps will be required in the summer months when the water is warm, and only one during the cooler months.

An air washer is provided for each generator. During the cold weather the air is admitted into the turbine room through the monitors on the roof. In mild weather it is admitted through ventilators in the windows. The warm air is discharged into the boiler-room basement for supplying the furnaces, and in cold weather part of it is bypassed into the turbine room to temper the air there. Automatic dampers are installed in both the intake and discharge ducts to act in case unusually high temperatures should occur.

To protect the generators from serious internal injury due to insulation breakdowns, both ends of each phase winding are run through current transformers which are differentially connected so that they will open the main-generator and field-circuit breakers in case of general trouble. Excitation is supplied at 240 volts, being normally provided by directly connected exciters, although emergency excitation can be furnished from the direct-current station-service system. Arrangements are made for automatically cutting off the normal source of excitation if trouble occurs. Oil-switch control is supplied from an independent 120-volt storage battery and special motor-generator sets, though, if necessary, it may be transferred to the direct-current station-service battery.

There are two main buses with sectionalizing switches between generator sections. Each generator may be connected to either main bus through selector oil switches. Feeders are connected in groups of three to feeder group buses, which may be connected to either main bus through group oil circuit breakers. The oil circuit-breaker mechanisms are installed on the fourth floor, oil circuit breakers on the third floor, main busbars, potential transformers, feeder current trans-



THREE DRIERS WITH CAPACITY OF 10 TONS PER HOUR ARE PROVIDED

formers, feeder reactors and feeder group busbars on the second floor, and generator-current transformers, feeder lightning arresters, feeder potheads and disconnecting switches on the first floor.

The generator circuit breakers are separated a considerable distance from each other by placing three or four groups of feeder circuit breakers between them. The group circuit breakers supplying any one feeder group from the two main buses are likewise placed as far apart as possible, one being at each end of the section. This is done to reduce the possibility of trouble spreading from one feeder group to the other.

All 13,200-volt bare copper and cables are taped with approximately $\frac{1}{4}$ in. (6.3 mm.) of varnished cambric covered with a layer of cotton tape impregnated with a fire-resisting substance. Each generator lead consists of two 1,000,000-circ.mil single-conductor stranded-copper cable insulated with $\frac{7}{16}$-in. (11.1 mm.) cambric and covered with a flame-proof braid. The main busbars on either side of the room are made up of two or more $\frac{1}{4}$-in. x 4-in. (6.3-mm. x 10.1-cm.) copper. They are suspended from the ceiling and are separated by gypsum barriers 2 in. (5 cm.) thick.

The main circuit breakers are rated at 2,000 amp., 15,000 volts, and will rupture 18,000 amp. at the rated voltage. The group oil circuit breakers are rated at 800 amp., 15,000 volts, with a rupturing capacity of 18,000 amp. at the rated voltage; the feeder breakers

are rated at 300 amp., 15,000 volts, and will rupture 10,000 amp. at the rated voltage.

Feeder reactors of two sizes are used. Those for the 500-amp. circuits are rated at 500 amp., 114 kva., and those for the 200-amp. feeders at 250 amp., 57 kva. In each case there is 3 per cent voltage drop across the reactor when carrying rated current. The percentage is based on the voltage from phase wire to neutral.

On account of the fact that some of the motor-driven plant equipment, such as that for coal crushing and pulverizing, is installed at a considerable distance from the source of supply, it was decided that such auxiliaries should operate at 480 volts. It was further decided that some direct-current auxiliary service should be made available for the turbine-room crane, motor-operated steam valves, magnetic pulley and other operations requiring variable speed. To make this direct-current service available as an emergency source of excitation 240 volts was selected. To simplify the station power service the control of main and emergency auxiliary feeders was placed under the switch-house operator, who handles this system exactly as if it was a substation supplying a group of customers. To protect the workmen and station attendants safety switches have been adopted for use at the various motors.

Service for the alternating-current auxiliaries is furnished by two 3,000-kva., 13,200/480-volt, three-phase transformers, one of which is a spare. They are installed in the turbine-room basement, so that the cables supplying them are short, do not pass through any part of the plant and will never be subjected to unusual heat. To insure continuity of service the busbars, transformers and feeder circuit breakers and feeders to each main division of the plant are in duplicate. The switchboards are constructed so that either half can be "killed" without interfering with the service from the other half.

Two 300-kw. motor-generators, one for reserve, supply the direct-current service. To guard against shutdowns a 150-cell storage battery is kept floating across the 240-volt direct-current bus.

The greater part of the station lighting is supplied from the 480-volt station-service bus through transformers stepping down to 120-240 volts, three-wire, for distribution. Emergency lighting circuits have two lamps in series across the direct-current station-service bus. Other circuits are arranged for throwing on the direct current if required.

This article is based on information furnished by John Anderson, chief engineer of power stations; R. H. Pinkley, engineer of way and structures, and G. S. Post, electrical engineer of the Milwaukee Electric Railway & Light Company.

Market Prospects for Electric Apparatus in Latin America and in Spain

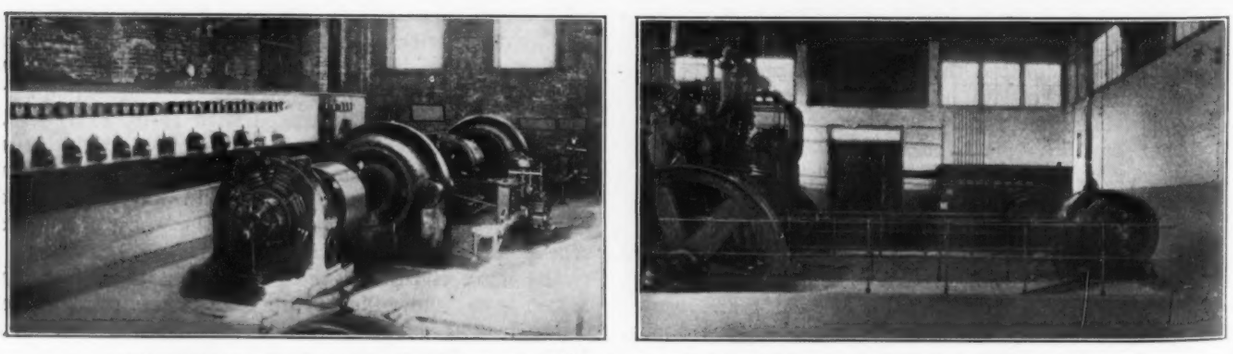
The Opportunity in the Mining, Agricultural and Manufacturing Fields — Status of Power House, Substation Transmission and Railway Electrification—The Outlook for Motor Drive

By PHILIP S. SMITH
Associate Editor "Ingeniería Internacional"

LATIN AMERICA, as the term is usually applied, consists of twenty republics with a combined population estimated at ninety-two millions. Comparatively undeveloped today, it requires only capital and an energetic state and individual initiative to bring forth the resources now lying untouched or but slightly exploited in the fields of mining, agriculture and manufacturing.

The mountainous countries of Mexico, Central America and the Pacific Coast of South America contain mineral deposits of proved extent and value. Cuba, Brazil and the Andean provinces of Argentina also have their active mining regions, which—in the last two, anyway—are capable of much greater development when better and cheaper transportation facilities are made available.

Operations being carried on vary from the little hand miner with a few Indian helpers to companies with tools, machinery and plant equipment costing several million dollars. The big mines have found that



TWO TYPICAL SOUTH AMERICAN POWER STATIONS, ONE A HYDRO-ELECTRIC, THE OTHER A STEAM PLANT. IT IS FROM STATIONS OF THIS KIND THAT THE SPREAD OF ELECTRICAL DEVELOPMENT IS IMPULSING

electricity is indispensable to their success. Some of the smaller properties have also provided themselves with power machinery, while many more are yet to be so equipped. With the recovery in the price of metals a large number of mines will resume activities and again become purchasers of machinery of all sorts. This is true especially of Mexico, where low prices and other unfavorable conditions have rendered operations impossible for a long time.

Agricultural developments differ widely with the characteristics and topography of the particular country. Argentina, Uruguay and a few other sections have facilities for extensive grazing and cereal crops. In the remaining countries the land is divided into small, intensive farms, pastures or well-organized vineyards and banana, coffee, cacao, tobacco, cotton and sugar plantations. All have need for power, with the possible exception of the banana and cacao plantations. The latter will also need power if artificial dehydration should be introduced extensively.

Irrigation projects are being terminated in some localities, and in others they are in the preliminary stages with fair chances of early completion. The canals frequently permit the generation of energy at different points sufficient for local needs. The most striking use of power in connection with agriculture is for sugar-mill electrification, and many opportunities are offered in this direction. Brazil, in particular, must renovate its system completely if it is to be a large factor in the world's sugar markets.

The equipment of the farm with mechanical appliances will probably be a slower process than in the case of the mines, but large estates and small alike are taking advantage of streams or irrigation ditches crossing their property to put in a waterwheel and dynamo for electric lights, and power is sure to be required later on. Where water power is not to be had, as in much of the farming region of Argentina and Uruguay, the self-contained set with dynamo and direct-connected internal-combustion engine is the logical successor of the kerosene and actylene outfits upon which the country dwellers have been forced to rely heretofore. The land owners have now taken up the idea of having their own electric plants, and the prospects for sales when money is again being made on the farm seem reasonably good.

THE MANUFACTURING FIELD

Assembling and manufacturing is permanently gaining ground. Few of the factories are large, according to our conception, but in the aggregate they turn out a great volume of goods and require an increasing quantity of power-driven machinery. Many have seen fit to choose sites away from populous centers and to erect their own power plants, but the tendency is to concentrate where there is good central station service, as in Rio de Janeiro, São Paulo and Buenos Aires.

Spain, with its twenty-two million inhabitants, is well advanced in agriculture and mining. It has reached a higher plane of industrial progress than any country in South America, and with it has come an awakening to the possibilities of doing more than merely filling a few of the demands of the home trade. There is now a well-defined effort to enter foreign markets with various products. But in order to do so profitably manufacturers must acquire tools and processes as advanced as those of their foreign competitors. Old equipment is therefore giving way to new, while only the latest types are considered satisfactory for initial installment in industries recently established.

Many sorts of electrical goods are made within the country. Nevertheless, Spain is not independent of outside sources, and several million dollars' worth continue to enter each year. Foremost among the articles which continue to find a ready sale are generating units, both small and large; control and substation apparatus, transformers, transmission-line accessories, except insulators, street-railway motors, controllers and overhead supplies; railway electrification material, meters and measuring instruments, batteries, telephones and telegraph material and bare copper wire.

GENERAL interest in the export opportunity for American manufacturers of electrical equipment is increasing steadily, and there is a real need for dependable information and expert advice regarding the existing conditions and prospective needs of foreign countries. Naturally the mind turns first to that great growing field awaiting development in South America, and a study of Latin America leads to consideration of Spain, since the trade customs and many aspects of the market link the two together. This article is the first of a series in which Mr. Smith will review the market for American electrical products in the different trade fields. This article embraces apparatus only. The second paper will cover supplies and appliances, also in Latin America and Spain. Subsequent articles will picture conditions in Europe and the Far East and will give some guidance toward the development of distribution in foreign fields. Mr. Smith has an intimate knowledge of the subject as a result of many years in the service of the Department of Commerce of the United States Government and can speak with particular authority on South America and Spain.

THE FIELD FOR PRIME MOVERS

Generators, switchboards and prime movers find a sale in three well-defined fields—namely, the plants already in operation which desire to increase their output, the small municipalities requiring equipment for original installations, and isolated plants owned by individual mining properties or industrial enterprises.

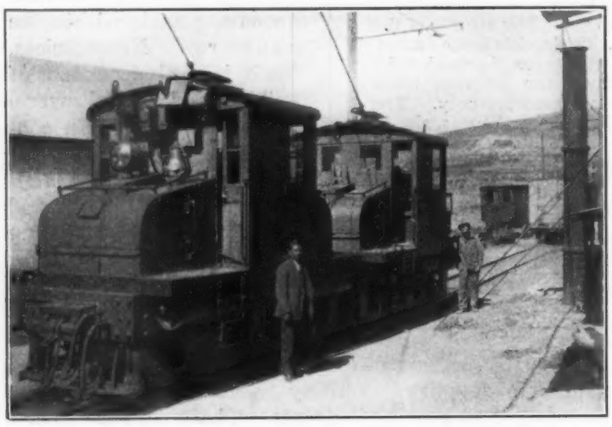
All types of prime movers find an application at one or another plant. In some sections the call is for a waterwheel suitable for high head and small flow, while not far distant one for low head and big flow may be needed. In countries where alcohol or petroleum is produced internal-combustion or Diesel engines for small towns or auxiliary substations are indicated. These may also be the type best adapted to out-of-the-way places where fuel of any kind is expensive. The steam plant burning coal, wood or petroleum may be called for anywhere, and either alone or as a reserve in conjunction with either of the other two.

Nearly every large station has seen its load increase greatly in recent years, and several, including those at Lima, Montevideo and Buenos Aires, were obliged to buy additional units even at the peak prices that prevailed during the period of the European war. Many others, able to wait longer for more favorable quotations, will be forced into the market before long. The large plants were not exceptional in this regard as the same pressure is felt on the smaller stations, which have not added to their capacity for several years.

Orders for big units are unusual and should not be considered as more desirable than the larger volume of plants of 100 kw. to 1,000 kw. that are being purchased continually. Each year sees an increasing number of electric light plants replace the kerosene lamp or the tallow dip, and even greater movement in this direction can be counted upon as the better prices for raw materials bring prosperity to the farming and mining regions that have been obliged to go slowly for some time on account of lack of funds.

FOR ORE EXTRACTION

Just when these better prices will be forthcoming cannot be foretold, but it is certain that both Spain and Latin America are going to be called upon to renew the flow of their products to Europe and the United States concurrently with the increase of manufacturing activities, as they consist of basic industrial



TWO LOCOMOTIVES NOW IN SERVICE IN THE EARLY STAGES OF THE ELECTRIFICATION OF THE ANDES

necessities such as petroleum, copper, lead, iron, coal, tin, manganese, nitrate, wheat, hides, wool and meat.

With the reopening of the mines, one of the principal improvements over the period antedating the war will be a widespread employment of machinery in the extraction and handling of ores and minerals inasmuch as labor of all kinds has generally become less efficient while wages, taxes, freight and supplies are all higher. The solution of the problem of keeping down the cost of production in the face of these adverse conditions, which are felt alike in Spain, Mexico and Chile, must lie in the use of labor-saving machinery with electric drive. Fortunately it is possible to extend the application of this form of power in a great many instances because of the proximity of the mines to waterfalls or sources of cheap fuel.

LARGE DISTRIBUTION SCHEMES

There has been much talk and considerable study of a national distribution scheme to cover the entire country of Spain. This would consist of a high-tension network fed at different points by existing hydro-electric plants and by others to be constructed, as the one on the Duero River. Furthermore, it is proposed to erect steam plants to utilize low-grade coal at the mine. These would be useful in compensating for the lack of water power in seasons when the output from the hydro-electric plants is insufficient to meet the demand.

In Latin America there are several proposals for harnessing large waterfalls, notable among which are the Guayra or Sete Quedas in Brazil and the Iguazú between Brazil and Argentina. Energy from the latter would be transmitted a distance of some 750 miles to Buenos Aires to find a market, unless some chemical or metallurgical industry requiring power on a vast scale were to be established at or near the falls.

All of the projects are interesting as subjects for academic discussion, and it is not improbable that some or all of them will be accomplished at a later date, but they have not yet arrived at the point where they supplant the small town and infant industries as a real source of everyday business and profit to the manufacturer and dealer.

TRANSFORMERS AND SWITCHES

Transformers and switchgear being an essential part of an alternating-current system, they will be in demand both for proposed new work, such as outlined above, and for the expansions of present capacity. They will be required also for the new circuits that are supplying the outlying districts of those cities that formerly employed direct current until it attained the limit of economical service. Steam-road electrification is going to absorb many large units, as will the street-car companies for sending power to their more distant substations to keep pace with their natural growth.

European practice in employing transformers appropriately located to feed areas of reasonably large consumption is followed rather than the American practice of putting up small units for purely local use, the sales of which are thereby limited in comparison with the larger sizes. Substations for the distribution of power to street railways and isolated residential districts are already well known. More are going to be required as these expand, and further sales can be counted on for newer uses, as at industrial plants, port works and small communities or rural estates along the transmission lines of the power companies.

MOTORS AND MOTOR DRIVE

There has been a notable growth in the number of manufacturing establishments opened up since 1914 in both Argentina and Brazil. Many of the older ones have been forced to build extensions or move to new quarters to take care of their expanding business. Similar conditions exist in Spain. The high prices ruling for practically all finished commodities enabled these establishments to make a profit regardless of their imperfect organization and limited equipment. This cannot continue indefinitely, and the crucial time for them will come when foreign manufacturers are again pouring their goods into those markets. Some, possibly a very small number, will not be able to survive, but others have succeeded in so strengthening their position that the net result will be a substantial gain in local manufacturing.

FACTORY RE-EQUIPMENT

They can retain this advantage and keep in business only by adopting modern power-driven machinery and cutting hand labor to a minimum. For, although the latter is cheap when measured in terms of money, it is fully as expensive as the more highly paid labor of other countries on account of its relative inefficiency. Progressive factory owners are beginning to analyze

the situation and are learning that their salvation lies in a greater use of mechanical equipment. Once having arrived at this conclusion, they jump from their former primitive methods to those of the present day, becoming purchasers of modern machinery and skipping several of the preliminary steps that have made up the evolution of manufacturing in the United States and Europe.

INDUSTRIES TO BE EQUIPPED

By this it is not meant that automatic machinery or ultra-modern refinements are in demand or that it is likely that they will be for many years in any but a few industries, the consumption of whose products are great enough to take care of a large and steady output. Those that have reached this stage already are the shoe factories, cotton textile mills and nail and screw factories. Others which are approaching that stage are making glass bottles, crown corks, fur felt and straw hats, shirts, collars and ready-made garments in general.

Motor drive is not confined solely to the factories, but is being taken up by those engaged in mining and agriculture. Attempts have been made, for example, to run aërial lines through agricultural districts where the conditions seemed to permit it, in order to encourage the farmer to take power for the numerous purposes for which small motors are advantageous to him.

SUGAR AND NITRATES

The sugar industry must be conducted on more efficient lines to survive the present or future eras of low prices, and only mills showing low production costs will be able to continue. The experience of many Cuban mills converted from steam to electric drive has been that considerable savings were brought about through the change. This lead has been watched closely by other sugar-producing countries and isolated cases of electrification have been carried out. The more wasteful steam drive still continues to be in vogue, however, in Spain, Argentina and Peru in many mills that may reasonably be expected to adopt electric drive eventually.

A special case of the application of motors to mining and associated activities is found in the nitrate fields of Chile. Interesting possibilities are offered there because the producers must put themselves in position to get the nitrate out more economically than at present. Some of the things that play a prominent part in the number of mechanical aids to this industry are crushers, pumps and conveying and handling devices.

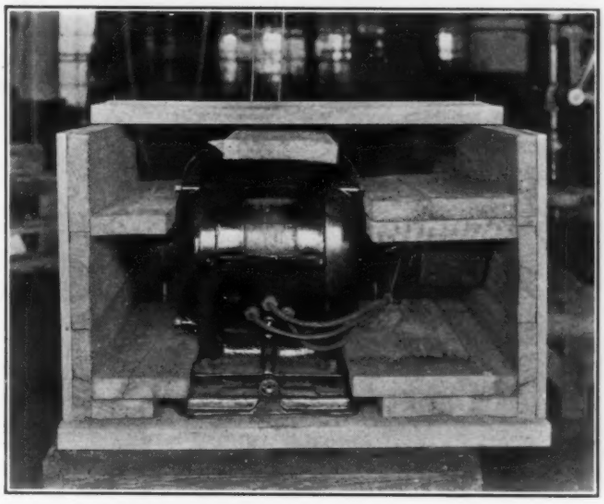
GROUP DRIVE PREFERRED

The favorite method of applying electric power is through the group drive. This seems to be due about equally to the economy in first cost over that of the greater number of small motors required for individual drive and to the influence of European practice, which is much better known than the American. The several sugar and textile mills afford unusual opportunities for trying to substitute individual for group drive.

Motor manufacturers in the United States will find various difficulties confronting them, but none that is impossible of overcoming. Those most common are the use of 50 cycles instead of 60, 440 volts direct current instead of 230 for the larger sizes, and a demand for slip rings with brush-raising and ring short-circuiting devices instead of squirrel-cage armature in induction motors even down to 5 hp.

Spain offers a very fertile field for the electrification of steam railways. Numerous projects have been studied, but up to the present time the only contract of any importance that has been let since the beginning of the war is the one for the section on the Northern Railway leading from Leon to Gijon, known as the Bajada del Puerto de Pajares. All of the others have been held up on account of the abnormal conditions of the last few years and will come up again for decision before long. Energy will be derived from the waterfalls in the districts where the roads run.

In Latin America two contracts have been awarded in the last two years, one for the line between Valparaiso and Santiago, Chile, and the other for a section of the Paulista Railway in Brazil. Both of these are



A GOOD EXAMPLE OF GOOD EXPORT PACKING, SHOWING THE NEED FOR RUGGED STRENGTH IN THE CONTAINER

but forerunners of other electrifications already planned for these countries.

In Argentina there is one suburban section that has been functioning as an electric road with motor coaches for several years. Plans have been made for extensions of the service to other branches. Another road has finished its power house and the work on the roadbed for an electrified section. It should be carried to completion soon. A third line is contemplating seriously an electrification of its suburban lines.

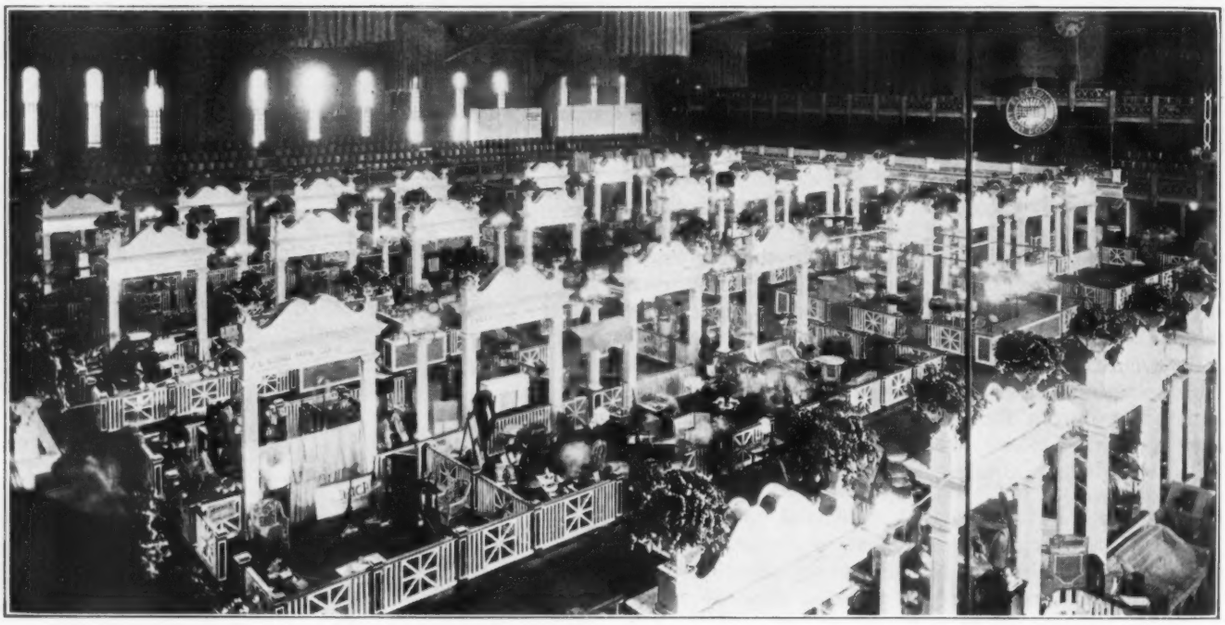
RAILROAD ELECTRIFICATION

Aside from these three roads, there has been a great deal of agitation for this change, and it is thought that much more will be attempted along this line during the next few years. Street-railway systems are operating in every city of any size, although there are still a number of places where new lines or extensions are required. There has been virtually a complete cessation of construction for seven years and even repairs have been kept as low as possible. New equipment is needed to replace what has been wearing out during that time, and most of the business to be placed in the near future will be for materials of this character rather than for new construction. New construction, however, will be begun in earnest as soon as conditions are substantially better than they are today.

What's the Matter with Electric Shows?

Why the Old-Fashioned Jumble Show Has Been Almost Abandoned — How a Real Functional Electric Show Can Be Equipped—What It Will Do

By EARL E. WHITEHORNE
Commercial Editor ELECTRICAL WORLD



THE OLD-FASHIONED JUMBLE ELECTRIC SHOW, NOW ALMOST EXTINCT, WHERE PEOPLE COME TO SEE WHAT ELECTRICITY CAN DO AND FIND ONLY APPLIANCES

SEVEN or eight years ago electric shows were popular. They were held annually in all the big cities and in a large number of the smaller cities. Even big towns had them. We were hearing of them all the time from all parts of the country. But today they are almost as scarce as the dodo. New York has one regularly, Chicago less often, Philadelphia sometimes. I don't think Boston has had one for years. I may be wrong, but anyway the electric show as an institution has been practically abandoned by the electrical industry. In spite of the fact that it is obviously a good thing to exhibit appliances to the great crowds that flock to an electric show, we have turned against it. I believe I know the reason why.

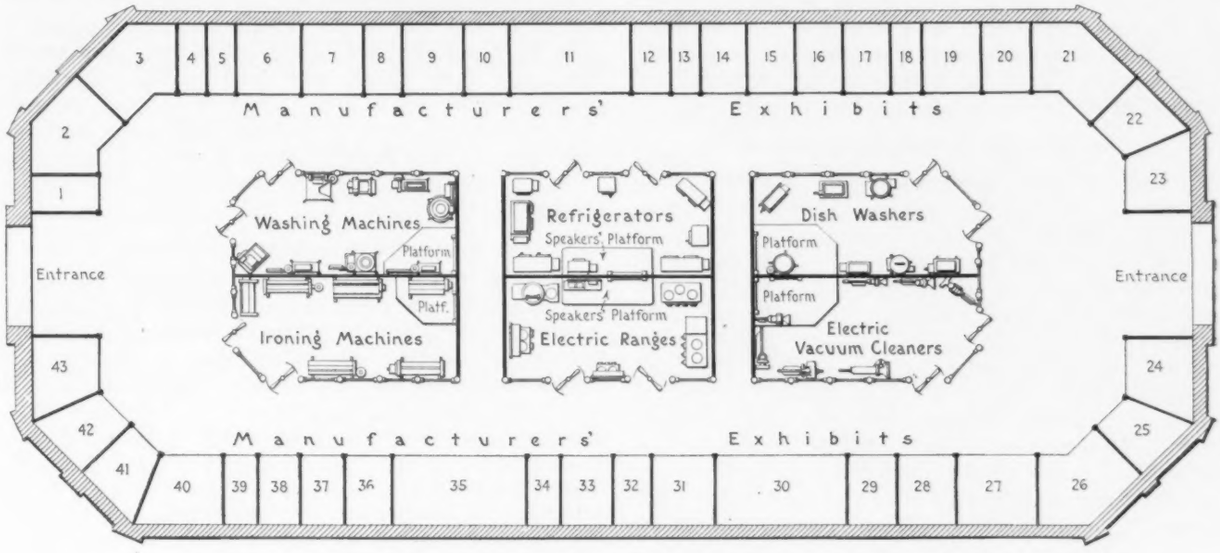
I have attended a good many electric shows in a number of cities. I have never been to one of them that I have not realized that something was wrong. It didn't get over. Here was a great throng of people come to see. Here was a great display of electrical appliances. They were both in the same place and yet they didn't get together, and the results fell far short of the opportunity. And the reason was because always the people were deceived as to what they were to see. They came to see electricity do things and we showed them only appliances.

The weakness in the electric show that has caused it to languish and lose its popularity, I believe, can be charged up to wrong thinking on the part of electrical men. We have all been thinking of an electric show in terms of appliances, whereas the public thinks of an electric show in terms of functions. We advertise: "Come to the Electric Show. See how clothes are washed and carpets are cleaned by electricity!" And that night at dinner Mary says to John: "Let's go to the Electric Show down in the Armory and see if this electric refrigerator really is practical. I don't understand how it works and I'd like to." And John replies: "All right. And I don't know but that it would really pay us to buy a clothes washer. This washerwoman charges so much, plus food and carfare, that it seems as though we could buy a washing machine for less than that." And so they go. And what happens?

John and Mary enter the armory with a lot of other people and find the place thronged. But it looks gay, and a band is playing and apparently there is lots to see, so they pick the first aisle and start to work their way along from booth to booth. They have come, understand, to see how electricity washes clothes, sweeps rugs, does dishes, irons waists, cooks and refrigerates. And what does the electrical man show them? He presents to their eager eyes a great clutter of mechanical devices in endless duplication, a mass of flatirons, percolators, grills, vibrators, washing machines, cleaners and other junk. In other words, they come for milk and we give them a milk ticket. We show them fifty-seven varieties of clothes washers full of suds; we exhibit a scattered assortment of flappers

spreading and cleaning up stage dirt on rugs; we let them smell the ozone and blink at the radio, but we don't show them and explain to them how electricity does housework. And that is just what they all come to find out about.

I went to the New York Electric Show last fall. It was as good a one as I ever saw—not as big or as elaborate as some former ones—but in an armory, all in plain sight and apparently lots to see. We were a party of five, three of them women who had asked me to show them just what every woman wants to see at an electric show—how clothes are really washed, how the electric refrigerator works, and if the dishwasher really washes dishes clean. One of the party also wanted to buy a



A LAYOUT FOR A REAL FUNCTIONAL ELECTRIC SHOW, WHERE THE STORY OF EACH APPLIANCE CAN BE TOLD IN TERMS OF ITS HUMAN INTEREST AND THE SERVICE THAT IT RENDERS

percolator as a wedding gift. So we all went, and, of course, there was a jam of people there ahead of us. Around each booth there was a crowd. Those in front were talking to the demonstrators; those in back couldn't hear and couldn't see. If they wanted to find out anything they had to wait until they could work up to the front. Sometimes we did; sometimes we didn't.

Every little distance there was a clothes washer—not washing clothes, but tiring out a mess of suds. Here and there were dishwashers—not washing dishes, but wildly dashing water around behind a glass false front, with perhaps a couple of drowned cups inside. In between were always flatirons or vibrators or more toasters or something else that we thought we had just left behind. Of course, I knew the ropes and led my party into the side gate of a booth to meet the man in charge and pick out the percolator, or to get a real look at the washer I thought best. But the poor "pee-pul" who had paid to get in had to line up at the rail and wonder how we got away with it.

We worked our way to the place where the refrigerators were, and there we saw some beautiful white cabinets with glass doors. When we got through to the silk cord and unhooked the barrier, we went in. The man in charge graciously permitted me to open up the box and give a private "ballyhoo" on the principles of mechanical refrigeration. But the crowd outside couldn't hear, and all they saw was a very handsome white box. There was also a very interesting exhibit of wired furniture with some modest cards that admitted that it was so. I found a friend inside the rail who asked us all in, and I showed my party all about it and explained this new idea, but the throng beyond the rope gazed at the walnut suite and had to let it go at that.

I am not knocking this New York show. It was as good as any I have ever seen. But it was conceived and produced by electrical men based on the idea that electrical men have always followed in their electric shows. It was an exhibition of electrical appliances, with everybody's goods in his own booth, the more the merrier. But this is not what the people come to see. John and Mary are not interested in the appliance; they care only about the *function* of the appliance. They want to see the washer wash the weekly wash and know just how a mere machine can make clothes clean, and if they are invited to see these things and come to the Electric Show, I believe that John and Mary are entitled to be shown.

"Well," says the central-station man and the manufacturers who read this far, "what are you going to do about it?" I'm going to make this suggestion—that in future electric shows electrical men play fair with the public in this regard. And I believe there is a way it can be done.

I am enthusiastic about the "home electric" as an influence for the popularizing of electrical appliances. It shows the appliance in the atmosphere of a real home. The device is demonstrated before a small group and it makes a deep impression. I believe that we are going to see the "home electric" an annual or semi-annual or quarterly event in every progressive city in the land, located each time in a residence section where one has not been established before. But in the large cities there is also a place for an annual electric show. The "home electric" is a neighborhood affair in the bigger communities, a demonstration of the complete electrical equipment of a single home; but the electric show is a great mass exposition of everything electrical to be shown to all the city. It supplements the "home electric." It brings the opportunity to talk to all the people at once, to show everybody all about it in this

bigger way—and the people come. The question is, what can you do when they get there? And the answer is, do what they want you to do. Show them not just the appliance but the function of the appliance. Show them how and explain why.

I have prepared a layout for a functional electric show that I believe will tell the people what they want to know and still give the manufacturer his own booth for the display of his own line, with a better chance to make a profit than he has ever had before. According to this plan, as the diagram shows, the manufacturers will all be given numbered booths around the outer wall of the armory, each to have one booth or as many as he wants and to display his goods as he sees fit. This is the appliance exposition where the people can buy any device they want and listen to as many manufacturers' arguments as they desire. But in the center section will be the functional electric show that shows what electricity can do and how it works.

How the Functional Show Works

Here in the center there will be, say, six demonstration spaces, one each for clothes washers, ironing machines, refrigerators, ranges, cleaners and dishwashers. Each of these demonstration spaces will be built with partitions, say, 12 ft. high at the back and sides and a rail in front broken for an entrance and an exit, with a rope or turnstile. It will be large enough to accommodate from twenty-five to fifty people standing. Around the walls will be one each of all the types of washers or cleaners exhibited in the show. At the back there will be a platform large enough for a lecturer and one washer, range or dishwasher for demonstration. Above each appliance there will be a placard on the wall, saying: "This is the Wishy Washer, manufactured by the Wishy Washer Company, Booth No. 46." Behind the lecture platform will be a blackboard, a rack for charts, and the clothesline, kitchen cabinet, china closet or other properties needed for the demonstration.

In each demonstration space, during each afternoon and every night, a five- or ten-minute lecture will be given every fifteen or twenty minutes to as many people as may be in the space. The lecturer for the clothes washer, for instance, will tell what makes clothes dirty and how the process of saponification breaks up the greasy binder and releases the dirt. He will demonstrate with real clothes in the washer before him, telling how the machine makes the clothes clean. He will explain that there are three types of electric washers, all good, but each having its own particular advantages. He will point to the different makes of the several types on display and state that each washer may be examined at the manufacturer's booth. "Good-by. Please leave by the exit gate so that the next group may enter promptly." And out they will go and in will come the new crowd, and anybody who is really interested in the purchase of a washer will look them over in the demonstration booth and then go to the booth where they are sold.

The same process will be followed in each of the six or more demonstration booths. And there might well be other spaces equipped as a model kitchen, dining room, bedroom, laundry, each with a lecturer.

Who will do the lecturing? The demonstrating will be done by representatives of the manufacturers, each afternoon and every evening being allotted to a fresh lecturer, these lecturers to be schooled in advance by the show authorities and provided with an outline of a talk on the function of the appliance. The speaker will not talk on the advantages of this type of machine, but while he talks he will use his own machine for demonstrating and the other will be on display. The show authorities may listen in on these demonstrations to see that nothing but a straight functional story is told, because that is what the people have come to hear.

In this way every twenty or thirty minutes in each of these demonstration spaces a new group of people will hear a new and interesting story of how to do it electrically. The crowd will flow along with a purpose and some degree of satisfaction, for they will be learning something, and a show of this kind, I believe, will sell more goods and do more educational work, with smaller crowds and added comfort, so that the general distribution of free tickets by the central-station companies to pack the house need not be carried so far. And such a functional show clearly explained in the advertising should also attract a better class of visitors, because those who really want to find out will come, knowing that they will not just be shown a mass of ingenious household devices, but will be really told how to reduce the burden of household work and expense.

Electrify the Business Shows

There is a place in every city for this kind of an electric show. It will tell the story to thousands of people and certainly should prove more resultful both for central stations and manufacturers than the old jumble show that has been slowly counted out in more and more cities. And then there is another kind of an electric show that I believe in, which is not an electric show at all, but the conspicuous electrification of the other kinds of business shows that are constantly being held in every good-sized city. Electricity may be made a feature of each one of them and year by year tell a diversified story that will have tremendous selling value.

Here is a partial list of the variety of business shows that are held in New York City every year:

Automobile Show,	Travel Exposition,
Clothing Designers' Show,	"Own Your Own Home" Show,
Industrial Exposition,	Sample Fair,
Poultry Show,	Retail Clothiers' Show,
Business Show,	Chemical Show,
Auto Equipment Show,	Public Health Show,
Ready-to-Wear Show,	Carriage Builders' Show,
Dry Goods Show,	Marine Show,
Motor Boat Show,	Hotel Men's Show,
Toy Show	Silk Show,
Flower Show,	Cotton Show,
Food Show,	Printing Show,
Auto-Body Builders' Show,	Music Show.

There is hardly one of these in which some kind of an electrical feature would not be appropriate, each show attracting different groups of people. Among them all—plus a real functional electrical show—the story of electricity can be told to all the people in the most appealing way. And this kind of an educational influence is fundamental, since it creates an appetite for the things that electricity will do and the comforts it will bring, and will lead to the wiring of houses and the buying of appliances. For no man wants wire for itself alone or a grill because it is ingenious. It is the function of the appliance that interests and appeals, and such an interest and appeal must be the forerunner of every sale. I believe that every central-station company in America should plan to organize and conduct this year a functional electric show and to electrify each business show that comes to town.

Improved Lighting System to Be Installed on Lincoln Highway

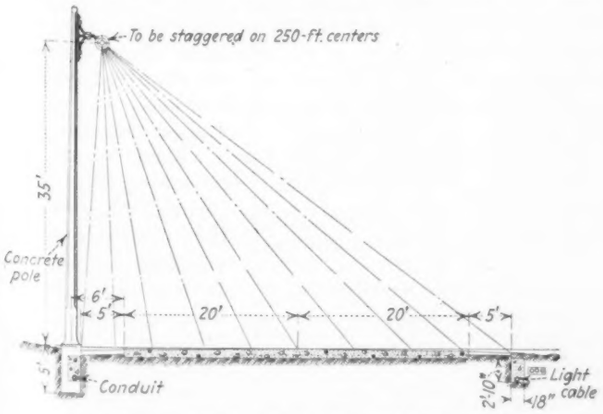
Among the Features Which It Is Intended Shall Mark the Completed Work Are the Concentration of Light on the Roadway, Flexibility of Arrangement and Reasonable Cost of Installation and Maintenance

By H. H. BELL
Illuminating Engineering Laboratory, General Electric Company

CONSTANTLY increasing night travel by motor vehicles has brought about a congestion of traffic, accompanied by an appalling succession of accidents, and one result has been a demand for improved highway lighting. Equipment intended for lighting city and village streets is not suitable. Hence a new system has had to be developed. This system has recently been successfully used in several places, notably on the Albany-Schenectady highway, and is now to be demonstrated on a 1½-mile (2.4-km.) section of the Lincoln Highway in Lake County, Ind. Preliminary plans for lighting it have been approved by the technical committee of the Lincoln Highway Association, and features of these plans will be presented in this article.

Before the system was developed it was necessary to determine the essentials of a satisfactory lighting unit. The most important were: (1) Concentration of the light on the roadway instead of diffusing it upward and over the adjoining fields; (2) a flexibility of arrangement that would make it possible to keep the light in line with the surface of the roadway under any condition, thus permitting the units to be placed on poles either near the road or some distance from it and to illuminate curves and grades, this plan necessitating a bracket that would permit adjusting the unit in both a vertical and a horizontal direction; (3) reasonably moderate cost of installation, operation and maintenance.

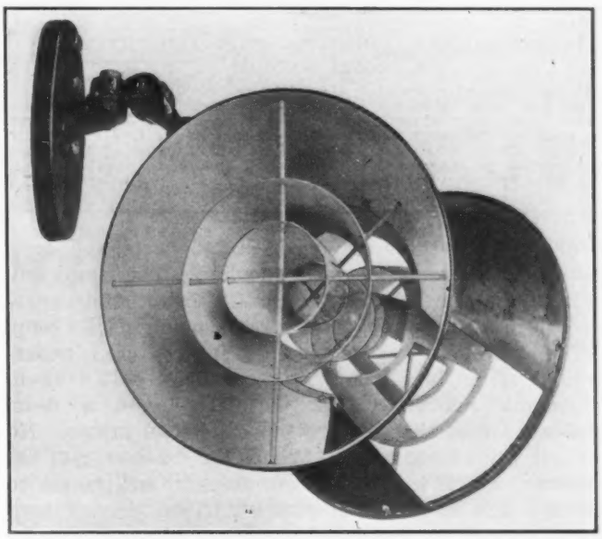
Obviously, units designed for lighting city or village



TYPICAL SECTION ACROSS LINCOLN HIGHWAY

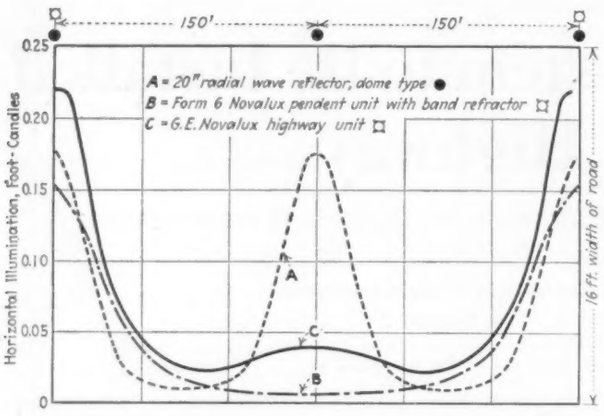
streets would not answer. Their purpose is to diffuse light over a wide lateral area and in some cases upward to illuminate the front of buildings. The expense of installing and maintaining most such types contributes to rendering them impracticable for highway lighting.

The study of the requirements involved led to the development of a highway lighting unit with a parabolic nest reflector and embodying certain new features for collecting the light rays and directing them where most needed. Described in simple terms, it consists of a nest of three reflectors, one within another, and with an opening in each, one each side of the lamp. By this means the greater part of the light that would be lost under ordinary conditions by reflecting upward and outward to the adjoining fields is collected and cast in both directions on the surface of the roadway. The rays that would escape if only one reflector were used are picked up by the inner reflectors and directed toward the roadway at an angle of 10 deg. below the horizontal. Two single parabolic reflectors to give the same effect would have to have approximately 15 ft. (4.5 m.) spread. The white reflecting surfaces of the unit reduce the glare, which might be objectionable if polished surfaces were used. This fixture also gives a much better distribution of the light rays than that given by the types of reflectors now in use along some highways on the outskirts of cities. The bracket holding the reflector is adjustable in both a horizontal and a vertical direction, making it possible to mount the fixture either on poles near the roadway or on those some distance from it and providing for turning it so as to illuminate curves or hillsides.



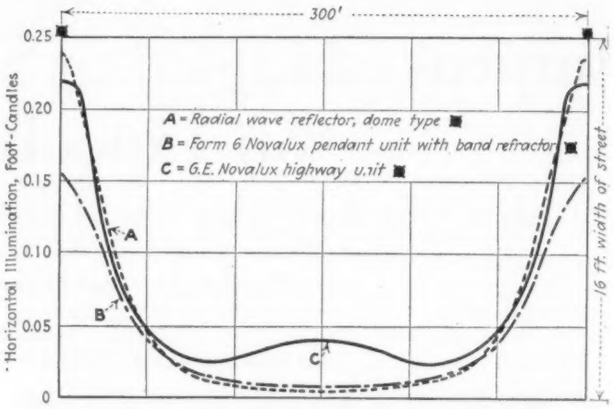
BRACKET-TYPE SERIES HIGHWAY LIGHTING UNIT

The Lincoln Highway lighting units are to be spaced on 250-ft. (76-m.) centers, staggered, the distance from the road surface to the light center of the lamp to be 35 ft. (10.5 m.). They are to be mounted on concrete



COMPARATIVE ILLUMINATION WITH APPROXIMATELY EQUAL WATTAGE

Illumination is calculated along the center line of the road on its surface with "Mazda C" series lamps mounted 10 ft. from the center line. With system A a 100-cp. lamp mounted 20 ft. above the road is used every 150 ft.; with system B and C 250-cp. units mounted 30 ft. are used every 300 ft. The ratio of minimum illumination to maximum is 0.062 with system A, 0.045 with B and 0.11 with C.



RELATIVE ILLUMINATION BASED ON EQUAL SPACING AND POWER

Illumination is calculated along the center line of the road on its surface. Units are assumed to be 250-cp. "Mazda C" series lamps, mounted 10 ft. from center line of road at 30 ft. above ground, every 300 ft., making the energy consumption 0.51 watt per linear foot. With system A the ratio of minimum road illumination to maximum is 0.022, with system B it is 0.045, and with C the ratio of minimum to maximum is 0.11.

standards, and these standards are to be placed along the outer edges of the gravel shoulder. The lamps will be 2,500-lumen (250-cp.) "Mazda C" series lamps, operated from a constant-current circuit supplying 6.6 amp.

The circuit is to be buried 12 in. (30 cm.) underground, using No. 8 B. & S. solid conductor with 4/32-in. (3.1-mm.) red-core rubber insulation and a $\frac{1}{16}$-in. (1.6-mm.) lead sheath having a band-steel armor. No conduit will be necessary. Where the cable crosses the roadway, which will be in two places, it will be pulled through a 3-in. (7.6-cm.) conduit. Thus, if any accident happens to the cable at these points, it can be drawn out of the pipe without disturbing the road surface. The supply circuit will be a single loop of cable carried along one side of the roadway and brought back to the transformer on the other side.

The transformer, which may be installed at either end of the circuit, is a 7.5-kw. type "R. O." constant-current unit, the primary supply being at 2,300 volts and 60 cycles and the secondary output 6.6 amp. constant current. This transformer is entirely automatic in action and can be installed in a manhole. It is controlled by an oil switch in the substation or from an oil time switch at the transformer.

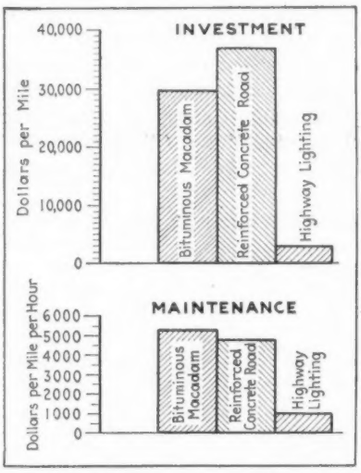
Following are some electrical data relative to the proposed installation:

Watts at lamp terminals	153
Line loss (watts)	15
Transformer loss (watts)	9
Watts at primary of transformer	177
Kilowatt-hours per 4,000-hour year per lamp	708
Kilowatt-hours per 4,000-hour year for system	31,152

The material called for by the preliminary plan is as follows:

Concrete standards complete with brackets	44
"G. E. Novalux" highway units	44
2,500-lumen (250-cp.) "Mazda C" series lamps	44
7.5-kw. type "R.O." constant current transformer	1
Primary cutouts, Cat. No. 104,227	2
Type IL series transformers, one-to-one ratio, to be installed in the base of each standard	44
No. 8 B. & S. solid conductor, 4/32-in. rubber insulation, 1/16 in. lead sheath, "CLAI" finish (ft.)	12,000
No. 8 B. & S. solid conductor, $\frac{1}{16}$-in. rubber insulation, "T. B. W. P.", for wiring from series transformer to fixture, inside of standard, (ft.)	3,200
Time switch, oil type	1
3-in. conduit (ft.)	100

From the standpoint of the motoring public and those pedestrians who, living in the vicinity of cities and towns, use the highways for walking, efficient highway lighting is imperative if the constant succession of accidents is to be ended and the congestion of the highways is to be reduced to a point where motoring at night will be safe and comfortable. More and more motorists frequent the roads at night, and an increasing number of truck drivers utilize daylight for loading and unloading and the night for travel. Headlamps, while absolutely necessary, do not solve the problem; in many cases they complicate it by throwing a blinding glare into the eyes of approaching drivers and pedestrians. That the lighting unit described does solve it is the enthusiastic verdict of both drivers and pedestrians who have observed it. It is possible to drive a car or truck either without or with headlamps along sections illuminated by it. The roadway is brilliantly lighted and clearly defined. The glare of approaching headlamps is nullified. From the central-station viewpoint more extensive highway lighting is going to encourage and promote the extension of rural power circuits to the surrounding territory. As to expense. The improved highway-lighting system can be installed at a very small percentage of the cost of constructing the highway, and the operating cost represents a comparatively small sum per year.



RELATIVE EXPENSES OF HIGHWAYS AND LIGHTING

The maintenance includes interest at 6 per cent and depreciation on the investment amounting to 10 per cent for macadam, 5 per cent for reinforced concrete and 20 per cent for lighting equipment (highways 16 ft. wide). The investment cost of lighting equipment is based on 300-ft. spacing, "G. E. Novalux" highway unit with 250-cp. "Mazda C" series lamp 30 ft. above roadway.

It seems fair to say that highway lighting, especially for the more traveled and congested roads, is a logical and legitimate part of highway improvement.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Temperature Only One Factor Limiting Rating

To the Editors of the ELECTRICAL WORLD:

Your issue of March 18, 1922, presents under the title "A Machine Rating Should Express a Definite Limitation" one side only of a much disputed subject. It is claimed that in order properly to apply electrical apparatus it is essential to know the real, reasonable limit of capacity of motors or generators; also that the 40-degree rating selects arbitrarily one of the many ratings which could be put upon the machine instead of giving the reasonable limit at which the machine could function indefinitely without injury.

Since temperature is only one of the factors causing motor deterioration, many engineers in this country and abroad do not deem it advisable to make the maximum temperature that insulating materials will withstand the basis of motor rating. Vibration, moisture, expansion and contraction and other causes tend to shorten the life of electrical machinery. Basing their opinion on experience, the adherents of the 40-degree rating consider this as the reasonable operating limit at which rotating electrical machinery can function indefinitely without injury.

For the application engineer's purpose the limit at which motors and generators can function indefinitely without injury is the name-plate time rating. This fact is known and thoroughly understood. Any engineer knowing the application can make his allowances, and there cannot be any danger of piling one margin of safety upon another, as stated in the editorial.

The public buying electrical machinery has a right to expect, and does generally expect, overload capacity or margin in the apparatus it buys. Margin or factor of safety is used in all branches of engineering and does not in any way interfere with intelligent application. It has been pointed out before that the electrical apparatus under discussion are self-destructive as compared with other apparatus—such, for example, as gas engines—which protect themselves by "lying down" when overloaded. Hence a statement regarding overload capacity becomes a necessity.

There has been no improvement in the art of insulating motors with class "A" insulation which would warrant a change in the method of rating general-purpose motors away from the 40-degree C. rating. According to the A. I. E. E., a rating of a machine, apparatus or device is an arbitrary designation of an operating limit, while the maximum possible rating is defined in paragraph 3504 of the 1921 "Standardization Rules" of the A. I. E. E. as the machine's capacity or capability.

Does the ELECTRICAL WORLD editorial advocate making a machine's capacity its rating? We note the statement that "the 50-degree rating, which has received the indorsement of the Electric Power Club . . ., is a more definite conception of the limitation of the machine than the earlier rating of 40 degrees."

The Electric Power Club has adopted as standards:

A. A rating giving a 40-degree C. temperature rise guarantee under continuous operation with a two-hour, 25 per cent overload guarantee at 55 degrees C., to be designated as the 40 degree rating.

B. A rating giving a 50-degree C. temperature rise guarantee under continuous operation without overload temperature guarantee, to be designated as the 50-degree rating.

The Electric Power Club has indorsed the 50-degree ratings "for conditions in which the load requirements are accurately known."

The Electric Power Club's 1920 "Handbook," Reference No. 5303, Sub. 3, as modified November, 1921, reads:

Machines having 50-degree ratings are designed for conditions in which the load requirements are accurately known and under which the machine will not be subjected to load in excess of its rating.

Standardization, in the field under discussion, has for its purpose the protection of the public against unscrupulousness. When applied to general-purpose motors, the 40-degree rating accomplishes this end better and should have preference.

JUSTIN LEBOVICI,
Engineering Department.
The Triumph Electric Company,
Cincinnati, Ohio.

The "Electric Fire" Reporters Make a Double Score

To the Editors of the ELECTRICAL WORLD:

Reportorial sleuths who delight in tracing fires to their source and three times out of four find the electrician guilty seldom let a week go by without convicting one of these culprits, but it is not often that they catch two electrical firebugs in one issue of a newspaper. Yet in the New York *Times* for March 30 there appears on one page this slightly hedged indictment:

Fire *starting apparently from a short circuit* between the walls of the Astor Theater and the Gaiety Theater Building, Broadway, between Forty-fifth and Forty-sixth Streets, last evening at 8 o'clock, was fought by members of the fire department with the assistance of stage folk, while the dense and excited theater crowds in Times Square looked on,

while a few pages further along this bolder accusation is made:

QUEBEC, March 29.—The famous shrine of Ste. Anne de Beaupré was destroyed today by flames, with a property loss of $1,200,000. *Defective wiring* ignited a pile of crutches cast down by pilgrims, who, after kneeling in the basilica, had risen, announcing themselves cured. Soon the church and the monastery of the Redemptorist Fathers were aflame, and for a time the whole village was threatened.

Thus the theater and the church are alike the victims of the universal malevolence of these persistent incendiaries. In the theater, where they have to deal with men of the world, they hide their fire-starting devices "between the walls," but in the church, where simple piety suspects no harm, they brazenly coil their defective wires around the pile of crutches near the altar. Can the witness be false? If so, who will detect the detectives? Perhaps the Society for Electrical Development, which has done good work along such lines, will put its own investigators on their trail and clear the accused even though the verdict has been rendered.

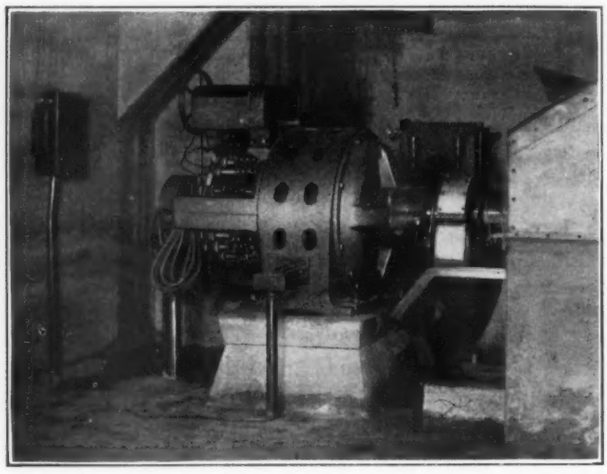
Brooklyn, N. Y. FRANK W. CHASE.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Variable-Speed Alternating-Current Motors for Auxiliaries

IN THE application of the alternating-current motor to auxiliary drive one of the chief problems has been the development of satisfactory equipment for variable-speed service. The direct-current motor until recent years has been used to a great extent for this service, principally because of its very satisfactory inherent characteristics for such application. The development of the alternating-current motor to replace satisfactorily the direct-current motor for variable-speed service



BRUSH-SHIFTING MOTOR CONTROLLED BY NEAR-BY PUSH BUTTON DRIVES FORCED-DRAFT FAN

has presented many difficulties and has so far included the following types of equipment:

(a) The constant-speed motor with some form of mechanical speed-changing device or the multi-speed pole-changing motor with or without mechanical speed-changing device.

(b) The wound-rotor type of motor with external resistance.

(c) The brush-shifting commutator type of motor.

Four-speed motors of the pole-changing type, driving stokers through two-speed gear boxes, have been operating satisfactorily for some years in several generating stations of the Public Service Electric Company.

The wound-rotor type of motor has been extensively used, but has the disadvantage of very poor efficiency and low power factor when operated at speeds much below maximum.

The brush-shifting motor, while only very recently applied to station auxiliary drive, has been used for several years for mine fan service and for some industrial applications. This motor is of the series type arranged to give variable speed by brush-shifting and is more efficient for such service than the wound-rotor type, particularly when the average running speed is much lower than the maximum. Its cost, however, is considerably higher than the wound-rotor type, and it has the disadvantage of a commutator.

Brush-shifting motors have been in service for fifteen months for forced-draft-fan drive in the Springdale station of the West Penn Power Company and are reported to be operating satisfactorily. The accompanying illustration shows one of these motors installed at this plant. In the Hell Gate station in New York 350-hp. motors of the brush-shifting type have been installed for forced-draft-fan drive, and their operation will be watched with much interest.

This information was embodied in a recent paper read by H. C. Albrecht, electrical engineer, connected with the Philadelphia Electric Company, before a combined meeting of the New York Section of the American Institute of Electrical Engineers and the Metropolitan Section of the American Society of Mechanical Engineers.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

Ready Method of Detecting Moisture in Transformer Oil

THE following approximate method of detecting the presence of moisture, either entrained or separate, in transformer oil has been found highly valuable to the writer because of the simplicity of the equipment necessary and the ease with which the tests may be performed in the absence of the more elaborate testing transformers.

A sample of the oil to be tested is drawn and placed in a clean flat-bottomed metal pan, such as a pie pan, and allowed to remain several hours undisturbed to permit the excess of moisture, if present, to separate out and collect at the bottom. If such an excess does exist, its presence can be readily detected in the small water beads that collect at the bottom. A hot blowtorch flame is then played on the bottom of the pan, when, if entrained moisture is present, a frying or crackling sound will be heard as soon as the oil has become thoroughly warm. This results from the formation of minute steam bubbles that can be seen rising to the surface. Some idea as to the amount of moisture present can be obtained by observing the quantity of bubbles and the intensity of the crackling sound. Failure of the bubbles to put in their appearance may be considered a good indication that the oil is fit for service, without further filtration, except possibly on high voltages, in which case a testing transformer should be used.

A word as to obtaining the test sample will not be amiss. With practically all transformer tanks other than those in which the oil has previously been well filtered and the tank sealed and provided with breathers, some traces of moisture will be found collected usually in the bottom around the drain valve. It is therefore suggested that oil be drawn from the tank until visible

moisture beads are no longer in evidence. The contents of the tank should then be allowed to settle from several hours to a day before a test sample is drawn. Such a sample will more certainly indicate the entrained moisture, which is the important thing, as the presence of very small quantities of water will greatly lower the insulating value of the oil and likewise its puncture point.

L. H. HARDIN,
Electrical Engineer.

Mees & Mees, Consulting Engineers,
Charlotte, N. C.

Closed-Circuit Ventilating System for Cooling Turbo-Generator

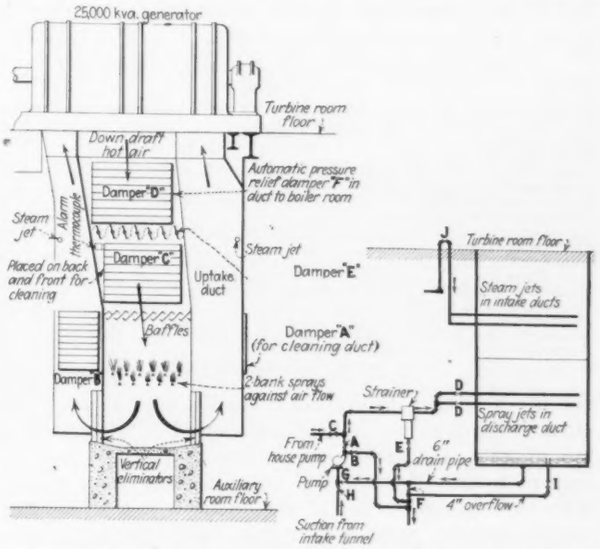
TO PREVENT generator fires arising from the deposition of dust in the ventilating ducts, the closed-circuit system of generator cooling has been adopted for the Fairmont (W. Va.) station of the Monongahela Power & Railway Company, the same air being used over and over again. This system was considered necessary because in the coke-oven and blast-furnace districts of Pennsylvania and West Virginia the atmosphere carries an unusually large content of sooty byproducts of the ovens.

To obtain an idea of the volume of impurities encountered in this district consider the air used in cooling a generator of 25,000-kva. capacity. The generator fans draw 50,000 cu.ft. of air per minute, which, taken over a period of twenty-four hours, weighs approximately 5,500,000 lb. About two cubic feet of impurities would be carried in this amount of air. With the old scheme of air washing, using a continuous blast of air from outdoors, if the washer removes 98 per cent of the impurities, three or four cubic feet of dirt would pass into the generator in three months of operation, much of which would be deposited in the ventilating spaces. These figures are borne out by experience gained in cleaning generators equipped with older schemes of air washing. This accumulation of dirt is very often the cause of generator fires.

In the installation of the air-cooling apparatus, built by the Spray Engineering Company, in this plant the designers placed the greatest importance on preventing the accumulation of dirt as a means of increasing the reliability of the unit, which has a capacity of 25,000 kva. The cost of pumping cooling water for the sprays and the loss of generator heat, which is not recovered, is of minor importance if fires can be prevented. Consequently it was decided to use a closed air circuit, simply cooling and humidifying and continuously repassing only one volume of air through the generator. No outside air with its content of dirt is used, and obviously the cooling air can pick up no new dirt after passing through the sprays.

OPERATING INSTRUCTIONS FOR AIR AND WATER SYSTEMS FOR TURBO-GENERATOR COOLER

Case	Operation	Dampers Open	Valves Open	Notes
I.	Normal—air recirculates	*E*	*A, D, F, H, I*	Uses no outside air
II.	Emergency — waste air (high water), water recirculates.	*C, E*	*A, D, G*	Used in flood periods, which rarely occur
III.	Emergency—same as normal, but (high water) pump against head	*E*	*B, C, D, G*	Dampers normal, but valves and pumps differ
IV.	Emergency — waste air and water (high water)	*C, E*	*B, C, D, G*	For very hot weather, both air and water hot
V.	Emergency—operation stops at (fire) operator's convenience	None	*J*	Damper *F* may open in case of fire: desirable but not essential to close *E*
VI.	Emergency—repair and cleaning, *C* or *D*	*A, B, C, D* or *F*	*F, I*	Short duration
VII.	Special—to control (room atmosphere same as VI.)	.....	Depends on conditions	



CLOSED-CIRCUIT COOLING SYSTEM FOR GENERATORS IN SOOTY DISTRICTS PREVENTS DIRT FROM ENTERING MACHINES

Left—Air-cooler arrangement showing locations of dampers. Dampers *A, B, C, D* and *F* open to atmosphere for cleaning, repairing, etc. *E* is across the discharge duct to prevent circulation of air during an emergency. In case of steam being used for fires, damper *F* automatically opens to relieve internal pressure.

Right—Water-piping system for cooling air. Valves *A* and *D* control sprays. *B* is used for discharge during high water. *C* is for emergency. *E* is a quick opening to clean strainer. *F* is a 6-in. drain closed during flood. *G* a 6-in. drain opened to use pumps against head. *H* is in the pump suction line. *I* is a 4-in. overflow to sewer, closed in flood to prevent back water, and *J* is a steam valve on operating floor for fire control.

The relative positions of the dampers, baffles and air passages are shown on the left of the accompanying illustration. A long period of thorough contact between the hot air and mist is secured by arranging the sprays to discharge against the flow of air in a vertical direction, thus increasing the efficiency of heat removal and rehumidifying. The arrangement of eliminators in a vertical position is the most effective possible. Above the sprays a series of baffles is used to prevent a jet of water from reaching the generator laminations directly above, in case of breakage of a spray head.

In removing the heat from the air that has been carried away from the windings and laminations water is normally wasted to the condenser water-discharge tunnel. At times of high water the circulating pump of the cooler is used to pump against external head, since the washer is installed below the flood level, and the supply of cool water is taken from the house-service system instead of being pumped from the condensing-water intake. The temperature of the air discharged from the generator is measured by a Brown indicating thermometer, the bulb being placed, as indicated in the illustration, in the discharge duct. An alarm contact automatically closes if the temperature reaches a dangerous limit. This, with the switchboard temperature indicator, is depended on to warn operators of any unusual conditions. The alarm attachment may be easily reset for checking at normal temperatures to ascertain that it is operating properly.

It is believed that the chief cause of fires has been overcome by this arrangement, but should any condi-

tion cause a fire, the means of quenching it are much more effective in this type of cooling. This is because the volume of air and oxygen to support a fire is limited to that of the ducts alone and would soon exhaust itself. In the systems using a continuous fresh supply of air the fire is augmented rather than stopped until the operator's attention is attracted and the air-washer inlet dampers are closed.

In addition to the small supply of oxygen, steam inlets have been provided further to quench the fires. In some previous installations of steam fire prevention the jets caused steam at 650 deg. Fahr. or more to impinge directly on the end turns of the generator coils. In this installation it was considered better practice to place the jets as far down in the ducts as possible and allow thorough expansion and reduction of pressure and temperature before the steam could reach the coils.

These steam jets are controlled by hand only, since the high temperature alarm would give warning to operators in time to ascertain conditions. Higher than normal temperature might be caused by overload or loss of water in the air-cooling system without the existence of a fire. In case the steam should cause greater than safe pressure in the air ducts, a set of dampers will relieve the pressure, automatically opening against a counterweight, releasing smoke, steam and gases into the boiler-room basement.

SOME FEATURES OF THE AIR-COOLER DESIGN AND OPERATION

Pump capacity at 85 ft. head (gal. per minute)	370
Motor rating (hp.)	15
Pump discharge (in.)	4
Rise in water temperature (deg. Fahr.)	14
Temperature air less temperature water leaving cooler (deg. Fahr.)	7
Number bronze nozzles	230
Cooling chamber dimensions	10 ft. x 8 ft. 7 in. x 7 ft.
Casing (gage)	12
Eliminators (gage)	20
Tank (gage)	10
Door dimension	18 in. x 30 in.
Maximum temperature river water approximately (deg. Fahr.)	83
Temperature water leaving cooler (deg. Fahr.)	97
Temperature air leaving cooler (deg. Fahr.)	104
Temperature rise in generator (deg. Fahr.)	45
Temperature air leaving generator (deg. Fahr.)	149

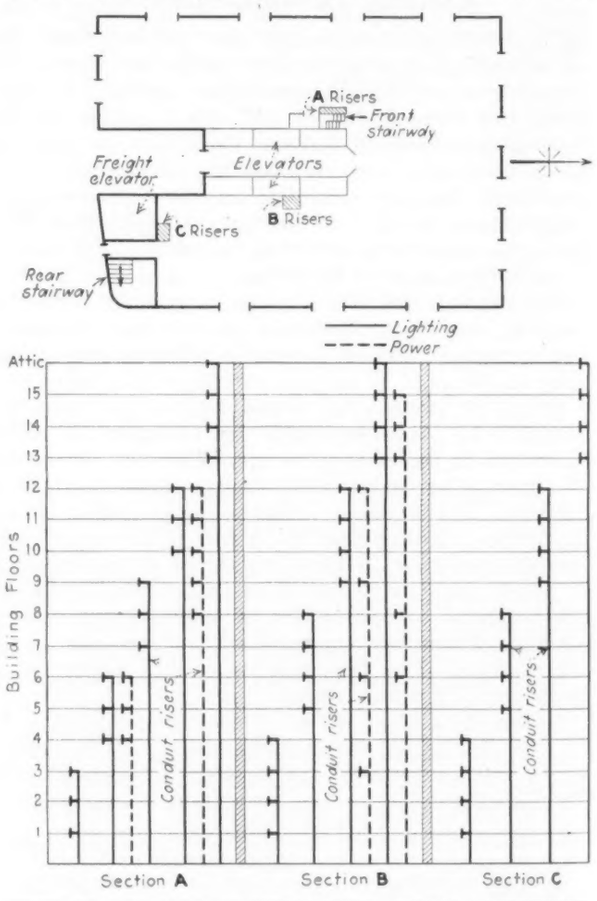
C. R. BEARDSLEY,
Electrical Engineer.
Fred T. Ley & Company, Inc.,
Springfield, Mass.

Value of Drainage and Separated Feeders Demonstrated During Fire

CERTAIN types of engineering construction proved to be very effective in maintaining electric service and in minimizing damage to electrical equipment during the recent Burlington Building fire in Chicago. The features were: (1) Separation of distribution feeders into groups feeding different sections of the building, (2) adequate drainage facilities, and (3) entire inclosure of all elevator shafts.

The distribution feeder system consists of three sets of risers. The main set, installed directly behind the west elevator, furnished light for the west and front sections of the building, each riser serving three consecutive floors in this section. The second set of risers was situated on the east side of the elevators, each riser serving four consecutive floors in the front and east section of the building. The third set, in the back of the building, supplied current for the south part, four floors per riser. With this separated distribution it was much easier to maintain service during the fire than it would have been if all feeders had been grouped in one tower.

After the fire it was found that the fire had had varied effects on each of three distributing boxes for each floor above the ninth. While the east and south boxes were in bad condition on a few floors, the majority escaped with merely having the distributing panels warped. However, it was found that the main feeder panel on each of the fifteen floors had been subjected to more intense heat than the other two, nearly all of these panels having been distorted and damaged so that replacements are necessary. All the insulation on the wires directly behind these panelboards was completely burned off, and inspection of some of these wires taken from the conduit below showed that the heat had penetrated even that far.



THREE SEPARATE SETS OF RISERS, EACH FEEDING A DIFFERENT SECTION, MAINTAINED SERVICE DURING FIRE

The main reason why the engine room of the Burlington building was able to maintain service during the fire was that beneath the sub-basement there lay an abandoned water tunnel which had a diameter of about 7 ft. When the great flood of water began pouring into the sub-basement from the fire hose, it was necessary to siphon the water into a draining well which extended down to the abandoned water tunnel and then pump the water out into the sewer. Without this tunnel it would have been impossible to maintain service, since flywheel generators were used and once the water had run into the flywheel pits it would have short-circuited the dynamos.

The importance of having inclosed elevator shafts was also emphasized by this fire. Since all the elevator

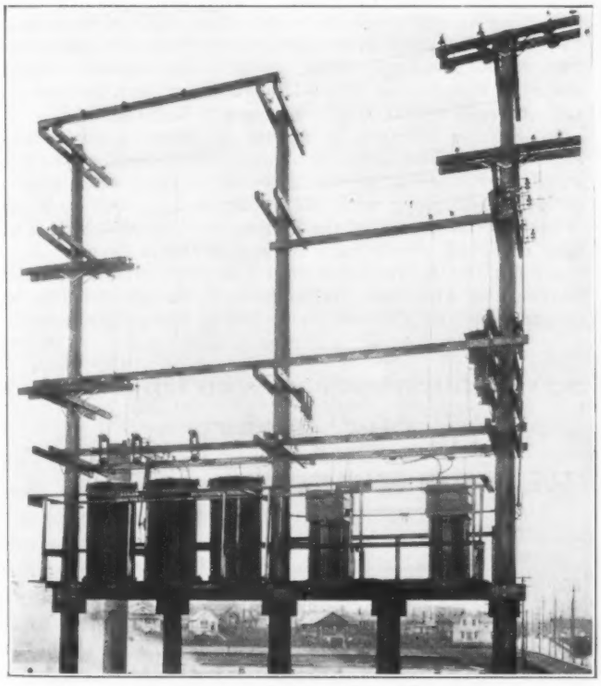
control equipment was placed directly above the elevator shafts, it would have been impossible to save this equipment if the fire had once broken through the elevator shafts. As it was, the fire only bulged in the elevator-shaft doors, and service was available the next morning up to the eighth floor.

This information was contributed by J. O. Batzer, chief engineer of the Chicago, Burlington & Quincy Railroad. FIELD EDITOR ELECTRICAL WORLD.

Chicago, Ill.

Pole-Top Substation That Serves City Distribution

FOR supplying 2,400-volt distribution circuits from 11,000-volt primary feeders and loads of from 500 kva. to 800 kva. the Northwestern Electric Company has selected a more or less standardized design of outdoor substations which are erected on poles. The photograph shows one such substation completed to nearly its ulti-



OUTDOOR SUBSTATIONS OF THIS TYPE SERVE CITY LOAD

mate capacity, though space is still left for the addition of one more regulator. The top position on the poles is occupied by the 11,000-volt primaries, and a hand-operated disconnecting switch is arranged for sectionalizing them. The transformers are connected to the 11,000-volt feeder through fuses of the disconnecting-switch type. Outdoor-type current transformers are connected between the transformer secondaries and the regulators, and 2,400-volt potential transformers are mounted on one of the poles. A by-pass connection, with the necessary disconnecting switches, is provided to shunt the regulators when desired. If meters are wanted, these are placed in wooden boxes for protection from the weather and used in combination with the type of standard outdoor current and potential transformers necessary. E. F. PEARSON,

Northwestern Electric Company, Engineer.

Portland, Ore.

Is High-Tension Outdoor Metering Always Desirable?

THERE are some angles of the problem of outdoor metering of electric service which appear to be worthy of considerable attention. If it were not for the expense entailed in the maintenance, and to some extent the first cost, high-tension metering would be preferable to any other, in view of the fact that all losses are so measured and that possible neglect by a consumer in not disconnecting his station when it is not in service would be in a measure paid for by the consumer. However, burn-outs caused by this neglect would not be paid for.

High-tension metering sets, as well as other metering sets for that matter, are subject to burn-outs, but in the case of high-tension metering sets the replacement of the burned-out parts is generally quite costly and delays in making replacements are greater than in the case of other metering equipment. Moreover, if it is attempted to carry spare metering sets, an outlay for additional equipment is involved, in addition to the extra cost of transporting such equipment to the places where it is needed and of installing it. All these factors must be taken into consideration.

COSTLINESS OF REPLACEMENTS MAIN OBJECTION TO HIGH-TENSION OUTDOOR METERING

In the case of high-tension metering where individual current and potential transformers are used, an objection is apparent in the costliness of replacements. Of course, there is also the investment tied up in spare current and potential transformers. It is the writer's opinion that high-tension metering equipment is subjected to greater strain from lightning than is low-tension equipment, and for this reason burn-outs are more likely to occur. If they do occur, the likelihood of turns in the current transformers becoming shorted is greater than in the case where the metering is done on the low-tension side.

If the metering is done on the low-tension side of the transformer, a very neat installation can be made by using a small house lined with sheet asbestos and mounting therein the current and potential transformers and the meter. This makes an installation that can be mounted at a point near where the secondary leads leave the transformers and one that is virtually fireproof so far as fire originating internally is concerned and is weatherproof so far as the protection of the meters and the other equipment is concerned. In addition to this, the cost of the low-voltage current and potential transformers is considerably less than that of high-tension metering transformers, especially if the latter are of weatherproof design.

Another advantage of low-tension metering equipment is that short secondary wiring may be obtained because of the close proximity of the current and potential transformers to the meter itself. In the case of high-tension metering it is always necessary, and especially so in outdoor metering, to mount the transformers at a considerable elevation and then in order to make the meter accessible bring the leads through conduit from the metering transformers down the pole from the crossarms to the house or cabinet containing the meter itself. E. C. FERREE,

Electrical Superintendent.

Trinidad Electric Transmission, Railway & Gas Co.,

Trinidad, Col.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Making Safety Regulations Acceptable

Suggestions for Drafting Rules by E. L. Milliken, Assistant Manager Blackstone Valley Gas & Electric Company, Before New England Division, N. E. L. A.

EXPERIENCE has shown that the manner of expressing safety regulations has an important influence upon their effectiveness with public utility employees. No one set of safety instructions can be of universal application, and conditions in the industry are so continually changing that the rules of one company today will not be sufficient for tomorrow. In drafting a set of rules, however, a few fundamentals may be laid down which will be of value to those compiling or revising existing instructions. In the work which the sub-committee on safety rules has been doing, these points have stood out impressively:

1. The term "rule" is psychologically wrong. No one minds being instructed, but the worker today, in general, objects to having to follow a rule. Therefore the term "Safety Instructions" or "Safety Code" is better.

2. Safety instructions should not be confused by being incorporated as part of the general operating instructions of any company. Rather let them be drawn up as a separate book or pamphlet.

3. As far as possible, they should be written in the vernacular of the particular department to which they are to apply. Too often safety instructions read more like a page from some legal document.

4. Let them be written in the affirmative as far as it is possible, that is, point out what should be done rather than what should not be done. There is a certain innate "cussedness" in human nature which many times manifests itself by one doing the opposite when told not to do something.

5. Particular attention should be paid to the printing and arrangement. The rules for any one department should be segregated and considered in a separate section of the instructions. Sub-headings should be liberally employed and the rules applying to that particular sub-heading grouped under it. By illustrating certain rules there would be evinced a tendency to humanize our safety instructions.

6. Keep out any extraneous rules that do not apply to your company. A smaller number of carefully chosen rules, rigidly enforced, is better than dozens of ill-considered instructions that are ignored.

7. Make every effort to include no instructions that cannot be enforced. Some employees are very critical and are always on the lookout for such slips, which they use to discredit the entire set of instructions.

8. In drawing up a code of instructions be certain that all classes of employees are comprehended.

9. No code of instructions would be complete unless there is included in it the N. E. L. A. instructions for "resuscitation."

10. After the instructions have been completed let them be thoroughly indexed.

11. Amend the instructions as often as changes in the art, additions to equipment or growth of the company warrant. When equipment with which employees are not familiar is to be added to plant, have the new instructions covering the use of this equipment issued before the equipment is placed in service.

12. In amending the instructions from time to time let the entire staff co-operate in compiling the changes.

13. Let it be known that suggestions from any employee as to the workability of existing instructions or the desirability of new ones are always welcome. When such suggestions are made, make certain that the employee making them is finally advised of the disposition of his ideas.

14. Keep a "weather eye" out for additional worth-while rules gleaned from the experience of other companies.

15. After instructions are once issued, it is important to keep everlastingly at the enforcement of them.

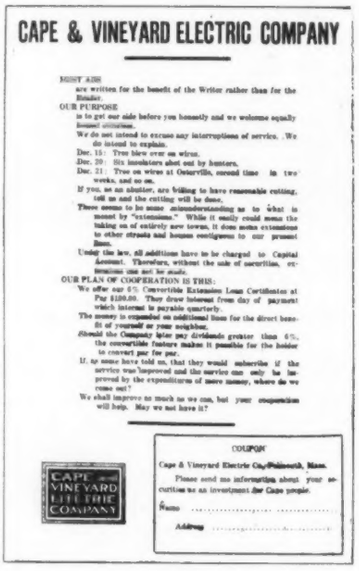
16. Some sort of periodic "follow-up" of safety instructions should be prescribed. This may take the form of periodic examinations of individual employees as to their knowledge of the rules or of systematic talks by officials.

17. Enforcement of safety instructions will be easier if employees are taught to realize that the instructions are primarily for their protection, rather than for the protection of the company. The company can replace material and even men lost or injured through accident, but the man cannot replace that which he himself has lost.

18. Safety instructions should be tied in with safety bulletins when an accident occurs. Immediately a suitable bulletin should be posted directed against this type of accident, and along with each bulletin may well go a copy of the instruction out of the instruction book which, if it had been observed, would have prevented the accident.

19. Let the public know that you have a code of safety instructions and that its purpose is to protect life and property, not only of employees but of the public as well.

Service Interruptions as an Object Lesson for Customers


CAPE & VINEYARD ELECTRIC COMPANY

RIGHT AIM
are written for the benefit of the Writer rather than for the Reader.

OUR PURPOSE
is to get our side before you honestly and we welcome equally honest criticism.

We do not intend to excuse any interruptions of service. We do intend to explain.

Dec. 15: Tree blew over on wires.
Dec. 20: Six insulators shot out by hunters.
Dec. 21: Tree on wires at Osterville, second time in two weeks, and so on.

If you, as an abutter, are willing to have reasonable cutting, tell us and the cutting will be done.

There seems to be some misunderstanding as to what is meant by "extensions." While it easily could mean the taking on of entirely new towns, it does mean extensions to other streets and houses contiguous to our present lines.

Under the law, all additions have to be charged to Capital Account. Therefore, without the sale of securities, extensions can not be made.

OUR PLAN OF COOPERATION IS THIS:

We offer our 6% Convertible Extension Loan Certificates at Par $100.00. They draw interest from day of payment on which interest is payable quarterly.

The money is expended on additional lines for the direct benefit of yourself or your neighbor.

Should the Company later pay dividends greater than 6%, the convertible feature makes it possible for the holder to convert par for par.

If, as some have told us, that they would subscribe if the service was improved and the service can only be improved by the expenditures of more money, where do we come in?

We shall improve as much as we can, but your cooperation will help. May we not have it?

CAPE & VINEYARD ELECTRIC COMPANY

COUPON

Cape & Vineyard Electric Co., Falmouth, Mass.

Please send me information about your securities as an investment for Cape people.

Name .....

Address .....

CAPITALIZING SERVICE INTERRUPTION

THAT tree trimming is a necessary adjunct to good service is the opening point displayed to advantage in the advertisement of the Cape & Vineyard Electric Company, Falmouth, Mass., shown herewith. In connection with a brief discussion of the importance of tree cutting the company turns the reader's attention to line extensions, their definition and how they can be financed. The advertisement concludes with an invitation to the public in the territory served to investigate its securities, the participation of the public in the development of the company and of the territory through improved electric service being designated as a plan of co-operation. Eugene Carpenter, Falmouth, Mass., is treasurer of the company.

A Tonic for Fair Weather Salesmen

WHENEVER it rains or snows or the sun gets a little warmer than usual every central station commercial manager knows that some of his salesmen will turn in a "weather report" instead of a sales report for the day's work. As a matter of fact, inclement weather offers the salesman his best chance to find people at home and willing to give him time to explain his proposition. One of the best arguments in favor of rainy-day selling appeared recently in the "Fuller Bristler" and can profitably be studied by every central station salesman. It says:

Have you ever gone skating in zero weather, played baseball or golf in the rain, gone swimming on a chilly day, or blistered yourself on a sun-baked beach? Haven't you put up with many discomforts in pursuit of pleasure? And haven't you, regardless, always maintained that you thoroughly enjoyed yourself? Of course you have. We all have. And if a man willingly put up with such discomfort in pursuit of pleasure, is there any real reason why he should not put up with the same things in business?

Still many who would willingly play ball in the rain, seek shelter under the same conditions when in pursuit of business. The rainy, sloppy, cold days are the best days in our business. Here are seven points for the outside salesman to consider.

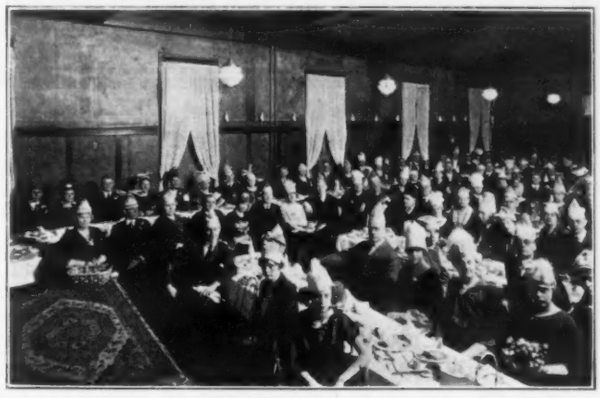
1. During better days, work your scattered territory or streets that are muddy or bad.
2. Save your "close together" territory with the good sidewalks and save your apartment houses for bad weather days.
3. Never track mud, snow or water into people's homes.
4. Get the "overshoe habit." Just a lightweight pair. Begin kicking them off as the lady comes to the door. This shows her by a positive suggestion that you figure on coming inside, and it shows her that you will not track her carpets.
5. Wear a lightweight overcoat, raincoat or cravenette. Drop it off your shoulders as soon as you enter. Don't let a wet coat drip on her floors, either.
6. An umbrella is not bad, but many umbrellas are lost and not easy to handle. Better than nothing, but a light coat is better.
7. Wear clothes that really protect you. Good warm gloves, good stout shoes, etc. Be prepared.

Remember, rain, sleet, snow, slush, zero weather are but little obstacles on the road to success in this business. If you cannot overcome the small obstacles you will never overcome the larger ones that stand in your way of big success.

A Complete Demonstration of Central-Station Service

ONE of the best examples of showing the public the actual workings of central-station service comes from the Lee Electric Company of Clarinda, Iowa. The picture shows the Greater Clarinda Community Club as guests of the company at dinner and an evening's entertainment of the club members. Following the dinner and a general jollification at the city's leading hotel the guests were taken through the company's power plant.

After leaving the power plant the office of the company was visited, where illustrations of the daily business routine were given. The cashier and the meter clerk demonstrated various operations, among them the procedure when an applicant for service calls at the office, an actual demonstration being given of the customer's application at the desk, the signing of contracts, the making of a deposit to guarantee payment of bills and making of connection tickets. All functions were explained as the different steps of the work were shown. A representation of a customer coming in to ask for discontinuance of service was also given, the supposititious customer bringing his contracts to show a deposit with the company, which was refunded after



ENTERTAINMENT OF CLARINDA COMMUNITY CLUB

the meter had been read and a bill rendered. Among other phases of the work shown were complaints registered with the company.

This demonstration by the Lee Electric Company of its work in serving the public has gone a little farther than most of the civic entertainment programs which have been conducted by central-station companies. Much of the publicity thus far has been given to the physical aspects of the property without any consideration of the great volume of routine work which is necessary in rendering 100 per cent service.

What Other Companies Are Doing

Hartford, Conn.—As a result of studies of lighting installations on its system during 1921, the Hartford Electric Light Company added 463 kw. in increased lamp sizes in existing installations and in increased intensities in new installations above those which would have been used had no surveys of this kind been conducted. Of this increase, 66 per cent was in office buildings, 16 per cent in factories and 18 per cent in stores.

Minneapolis, Minn.—Applications for light and power service received by the Northern States Power Company during 1921 were 10 per cent greater than for 1920, the best previous year. In Minneapolis alone 7,206 already-built houses were wired for electric service and connected to the lines of the company. More than 37,000 electric household appliances of all kinds were sold in Minneapolis—representing a 15,000-kw. load.

Boston, Mass.—Bill-payment agencies in localities remote from the stores and offices of the Edison Electric Illuminating Company of Boston are being established on the premises of certain electrical contractor-dealers, who handle the accounts on the basis of a small commission. These establishments carry attractive stocks of electrical appliances, and in one outlying town forty customers daily settle their service bills.

Oklahoma.—When the towns of Billings and Lamont were connected to the transmission lines of the Oklahoma Gas & Electric Company the city officials of the former carried out an appropriate celebration by suitably decorating the antiquated municipally-owned plant with a bow of black crape as the current was turned on.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

The Fuse Problem Common to All Who Make or Sell Appliances

By H. T. Bussman
Vice-President Bussman Manufacturing Company, St. Louis

ALL manufacturers and jobbers of lighting equipment and household appliances have a common interest and a common problem in the plug fuse. Times have changed with the conditions of the average residence installation, and more consideration of this point and more co-operation in meeting the situation will be exceedingly profitable.

Twelve years ago nine out of ten plug fuses were used on new installations. But the increasing popularity of heating and power devices has reversed the conditions entirely, and today but one fuse out of ten goes into new work and nine are furnished to the householder for the replacement of blown fuses. When there were only lamps in the home few fuses blew. The large variety of appliances now in habitual use by persons who give scant attention to whether circuits are overloaded or not has increased the consumption of fuses very greatly. It has also increased the annoyance of their use, and unless something constructive is done to make them easier to buy and easier to replace, the fuse is going to hold back materially the growing popularity of electric comforts. The public has not been educated to an intelligent understanding of why fuses blow and what to do when they do blow. There has been no means at hand for either the central-station company or the dealer to give to the consumer information on fusing that will be available for reference when a fuse blows and show how to replace a fuse quickly and easily and why fuses of the wrong size or pennies under the plug should not be used. Plug fuses have also been carelessly made with dark interiors and still darker mica windows that have made it impossible to see which fuse is blown. And no convenient way has been evolved until recently of selling plug fuses in such a manner that the customer will be influenced to purchase a reserve supply and be ready to replace blown fuses at any time, with the minimum of annoyance and the least possible delay in the use of the appliance affected.

Out of trouble with blown fuses a very serious and extensive resistance to the use of appliances and the free enjoyment of the comforts of complete electric service gradually developed. The leading fuse manufacturers, recognizing their responsibility, have met the situation in a most effective manner by making fuses with white interiors and clear windows, so that locating the blown fuse is facilitated, and by putting an end to the old cracker-barrel basis of selling. They have introduced an element of service in the merchandising of fuses by putting them up in cartons which bear full information as to why fuses blow and understandable directions as to what to do when fuses blow. Varying numbers of fuses are packed in these unit cartons by different manufacturers. I believe that at least ten fuses should be sold at once, because the average residence, we find, uses ten fuses annually and because ten fuses can be sold for a sufficiently small sum to make it worth while for the householder to have an adequate reserve. It helps the dealer to elevate his fuse business to a basis that is profitable for over-the-counter selling. It will materially reduce the fuse-trouble expense of central-station companies that do not renew fuses gratis.

The fuse manufacturers have thus provided the way to relieve, if not overcome, the annoyance of blown fuses in the home. It remains to bring into universal use the habit of buying fuses in quantity in a carton that tells clearly what to do when a fuse blows and how to do it. I believe that every appliance manufacturer and jobber and every central-station manager should consider it important and profitable to use his utmost influence with all his dealers to establish as standard practice the selling of clear windowed fuses in these educational cartons.

Time He Was Bracing Up

BUT, MA! I'M AN AWFUL SICK GUY!
YOU GET UP OUT OF THAT AN' SHOW SOME PEP! YOU ONLY THINK YA ARE SICK!
AMERICAN BUSINESS
Copyrighted, 1922, by The Star Company

A HOMELY suggestion for the man who thinks business is bad. Conditions are improving right along, but every one must go after his share himself. It is not going to come in voluntarily and seek you out.

Composite Data on Cost of Doing Business in Large Stores

COMPARISONS of the cost of selling electrical material with the costs of other merchandising businesses are interesting in determining the relative conditions. The table shows the cost of doing business represents a composite figure confidentially secured from twenty-five of the largest department stores in the

United States, constituting a chain reaching across the continent. These figures were taken from stores doing a business of $25,000,000 per annum and are

DEPARTMENT STORES' COST OF DOING BUSINESS

	Per Cent of Gross Sales
Rent	4.220
Salaries, including owners'	8.380
Advertising	3.930
Heat and light	1.100
Deliveries	2.820
Supplies	0.940
Insurance and taxes	0.838
General expenses	2.110
Depreciation	0.750
Bad debts	0.197
Total	25.285

fairly representative of an average of the different items named. The figures afford an easy method of comparing the various items of cost of marketing electrical merchandise with the same costs in other successful businesses.

A Comparison of Prices in Nine Commodity Groups

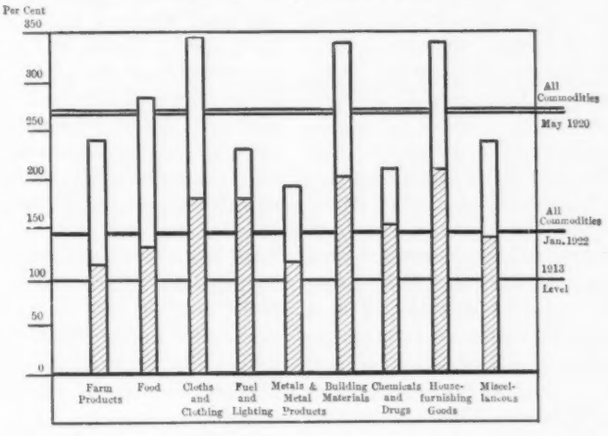
THE accompanying chart shows the relative price levels of nine groups of commodities for May, 1920, and January, 1922, based on statistics prepared by the Bureau of Labor. The chart brings out several points which need no detailed comment, but the pronounced differences in relative levels among the groups on each of the two dates are significant. At the peak of prices the cloths and clothing, building materials and house-furnishing goods groups were more than 200 per cent above pre-war figures. On the other hand, in spite of the very high general level, metals and metal products were only 93 per cent above their 1913 level, although far higher prices were reached by this group during the war.

Differences in relative levels at the present time are also shown. The tremendous decline in prices from the peak to current levels is also indicated by the chart The January, 1922, index number for "all commodities"—148—is as low as the index has gone during the present period of declining prices.

The relative prices plotted on the chart are as follows:

	May, 1920	January, 1922
Farm products	244	116
Food	287	134
Cloths and clothing	347	183
Fuel and lighting	235	183
Metals and metal products	193	117
Building materials	341	202
Chemicals and drugs	215	159
House-furnishing goods	339	214
Miscellaneous	246	146
All commodities	272	148

Relative Commodity Prices 1920-1922



THIS chart shows that the general price level reached its highest point in May, 1920, when the "all commodities" index number stood at 272. The full length of the upright bars indicates the relative prices of the respective groups at the high point while the shaded portion indicates their relative levels in 1922.

The Jobber Must Produce Volume Sales of Specialties as Well as Staples

BY A JOBBER

ONE thing that a great many men engaged in the distribution of electrical materials seem to overlook is the fact that to function economically the wholesaler and the jobber must provide the manufacturer with a volume of business sufficient to make his warehouse really decrease the cost of distribution over some other method of shipping and stocking. This clearly is the jobber's function in the sale of staple lines, and it must be no less so in the sale of such specialties as washing machines, vacuum cleaners and the like. The jobber must produce a volume of business that justifies his warehouse as a factor in the selling of these commodities or he cannot hope to be a permanent agent in the distribution of appliances.

To do this the jobber will be compelled to cast about for new and larger retail outlets for electric household appliances than are provided at the present time by the stores of the central stations, contractors and dealers, and this may mean that he must definitely develop the department store, which is already established with a large housefurnishing business. The obstacle to such an outlet, of course, lies in the fact that the department store is not in a position to service such appliances and that it is desirable that electrical men rather than outsiders may maintain the service contact with the householder who buys electric labor-saving appliances and should be guided to a proper and satisfactory use of the machines. There seems to be a way to reconcile the situation, however, by arranging a contract between the jobber and the department store or a local contractor and the department store whereby the entire service function for all appliances sold by the store shall be carried out by the electrical men. It has been done in a number of cases and proved entirely practicable, for the big store has the contact with the home and can sell many more appliances than a small shop can. But to sell successfully it must be schooled and organized and supported by a service staff under the direction of an electrical man.

The jobbing of appliance specialties is not the same process as the jobbing of staple lines. There is a very clear distinction, and it must not be forgotten that with either the staple or the specialty the jobber must produce a volume of sales or he is not doing the work that he is supposed to do. If the jobber is to be established as a prosperous and successful distributer of large appliances, the larger outlet must be created to insure the adequate volume of sales.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Motors, Generators and Transformers

Flux Distribution in Air Gap and Teeth of Dynamos.—ALFRED STILL.—This article deals with flux distribution from the standpoint of fundamental laws and principles, avoiding many of the empirical methods used by practical men. The subject is dealt with under headings concerning permeance of the air paths, the air gap, and the conditions in highly saturated teeth. Calculations of tooth density in terms of air-gap density and mmf., with a correction for the tapering of the teeth, are made, the whole argument being illustrated by a numerical example.—*Electrician (London)*, Feb. 10 and 17, 1922.

Traveling Cranes with Single-Phase Brush-Shifting Motors.—E. ALTSCHUL.—The Brown-Boveri company has developed an electric crane system in which brush-shifting single-phase motors are used for all three motions. Such a motor can be started by exciting the stator and shifting the brush holder from the neutral position more or less forward or backward. No controllers or resistors are required. This simplifies materially the electrical equipment of a three-motor crane. The mechanical equipment is, however, somewhat complicated. As two of the three motors change their position relative to the crane, it is necessary to provide some means to actuate their brush holders from the operator's cabin. This is achieved by using two flat steel bars along the crane girders, which can be rotated by levers from the cabin. On these bars specially formed steel clamps slide, transmitting the turn of the bars with levers to the brush yokes of the motors. Two levers are used for each motor, one actuating the stator-closing switch and the other the brush yoke. For a three-motor crane the operator has only two levers to manipulate, one for the traveling of the entire crane and one for a combined lift and cross-traveling motor. —*Brown-Boveri Mitteilungen*, February, 1922.

Lamps and Lighting

Use of Light in the Surgical, Dental and Ophthalmological Professions.—L. P. TINGLEY.—This article deals with the problems of the medical profession in securing proper lighting. It discusses the use of daylight, artificial light and combined lighting. With artificial lighting there is at the present time a tendency on the part of medical men to use too much light. This often does not result in the most efficient illumination with the least eye strain.—*Transactions of the I. E. S.*, January, 1922.

Making Electricity More Accessible in Offices and Public Buildings.—In order to allow for the more extensive use of electricity in offices and public buildings various methods of installation have been introduced, all of which tend to give increased flexibility. One method described in this article solves the problem of increased outlets by using as an electric conduit a metal base in the place of the baseboard ordinarily run around the room. Another method of obtaining increased flexibility consists of installing numerous receptables and plates fitted for interchangeable fixtures. Various special outlets, floor boxes and fittings are described and illustrated, as well as a device for providing additional outlets which consists of a standard receptacle for use in the "knock-outs" of regular outlet boxes.—*Electrical Record*, March, 1922.

Generation, Transmission and Distribution

New Type of Suspension Insulator with Spherical Head.—Description of a new type of suspension insulator which avoids the rigid bond between the metallic part and the porcelain and thus preserves the porcelain from cracking when the iron and cement expand with increase of temperature. The insulator has a cylindrical head in which is inclosed a sphere of porcelain flattened on two sides. This sphere is first baked, then introduced into the unbaked head, and finally the assembled unit is placed in the oven. Because of the 18 or 20 per cent shrinkage of porcelain during baking, the head narrows itself around the flattened sphere, but by a special device the sphere is kept from adhering to the interior of the head. Beneath the sphere is attached a metallic cap adjusted at an angle of 180 deg. to the sphere. All the iron parts extending into the head of the insulator are surrounded by elastic material, and the rod is not absolutely rigid, though, like the cap, it is prevented from turning. The space between the sphere and the surrounding part of the head is filled with an elastic substance which distributes uniformly the strain caused by the rod. This insulator, it is said, is able to resist stresses of 5,000 kg. Its resistance under oil and its insulating capacity are also held to be superior to those of other types.—*Industrie Electrique*, Jan. 25, 1922.

Efficient Burning of Fuel and Use of Waste Gases in Iron and Steel Plants.—W. W. PETTIBONE.—A general discussion of boiler-room operation in the iron and steel industry, comparing the efficiencies, economies, etc., of stoker-drive furnaces, powdered-coal furnaces and furnaces burning waste gases.—*Paper presented before Association of Iron and Steel Electrical Engineers*, February, 1922.

Traction

When Should Battery Locomotives Replace Mules and When Be Preferred to Trolley Equipment?—CHARLES E. STUART.—The author favors mules in early states of mine haulage, later accumulator locomotives, then trolley equipment. Comparative costs of hauling with mules and storage-battery locomotives show that in one instance $14,863 was saved by a storage-battery locomotive in one year. A very complete table is given of the performance and operation of a combination locomotive at a mine of the United States Coal & Coke Company, at Lynch, Ky.—*Coal Age*, Feb. 16, 1922.

Installations, Systems and Appliances

Locomotive Boiler Welding.—This article is the report of a committee of the Master Boiler Makers' Association on determining the best methods of reconditioning boilers. Methods are given for preparing and welding the various parts of engine boilers.—*Welding Engineer*, January, 1922.

The "Estrade" Farm System.—A. DELAMARRE.—An electric windlass for plow operation is described, with a number of novel features, such as a specially designed guide roll for the pulling cable, a hydro-pneumatic shock absorber to guard against suddenly arising overloads due to irregularities in the soil, an overload clutch between the drum and the 35-hp. motor, and so forth. If the windlass car is properly anchored, a pull of 3,500 kg. may be exerted upon the plow cable. To minimize the cost of temporary electric power lines the use of extremely heavily creosoted wooden poles so strongly penetrated with creosote as to be called "poteaux moirs" (black poles) is suggested. Wooden poles so treated have such a high electric resistance that it is possible to nail bare wires directly to them, resulting in a negligible loss at voltages up to 550. At 500 volts and 50 cm. between wires a current of 0.066 amp. was measured to flow through the wood. Finally a simple but very effective double-roll friction drive for slow-turning farm machinery is described.—*Revue Générale de l'Electricité*, Jan. 28, 1922.

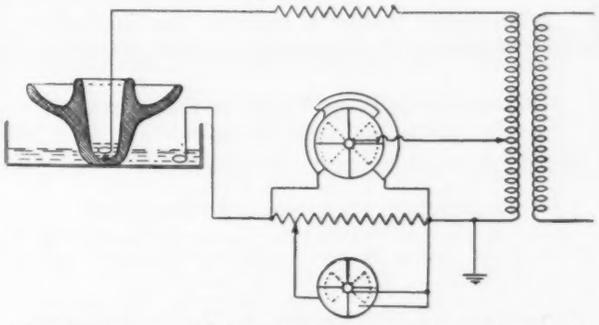
Electrophysics and Magnetism

Effect of Heat on the Electric Strength of Some Commercial Insulating Materials.—W. S. FLIGHT.—The variation in electric strength of many of the solid insulating materials at present employed in the manufacture of electrical machinery and apparatus were investigated between the temperatures of 30 deg. C. and 100 deg. C. The materials used were various kinds of prepared paper, micarta, fuller board, varnished cloth, mica and some miscellaneous materials. These tests showed that in the case of some of the materials used at present the breakdown voltage at 100 deg. C. may be only one-half that at 30 deg. C. Consequently all insulating materials should be judged and used in accordance with the breakdown voltage at 100 deg. C. and not on the results of tests carried out at air temperature.—*Institution of (British) Electrical Engineers*, February, 1922.

Units, Measurements and Instruments

Electric Railway Disturbances and Detection of Passing Electric Trains by a Galvanometer.—E. S. BIELER.—Investigations to determine the effect of disturbances on delicate electrical measurements made in the neighborhood of electric traction lines.—*Journal of Franklin Institute*, March, 1922.

Electrical Tests for Porosity of Electrical Porcelain.—J. E. SHRADER.—This article describes a method of testing insulators without danger of puncturing them as is often done with the flash-over test. Of course, a properly designed insulator free from mechanical defects should flash over on a high-voltage test. However, if the porcelain is porous and has absorbed moisture to any considerable extent, this test will result in a puncture which means a loss of the insulator. Where power-factor or resistance measurements can be made which will indicate the dielectric strength of an insulator, there is a distinct advantage gained in that these measurements may be made without the destruction of the sample. In the accompanying illustration apparatus for making power-factor tests of insulators is shown. From this power-factor determination of the dielectric strength of an insulator a very good and sure indication of moisture absorption can be obtained and in turn an



CONNECTIONS FOR MEASURING POWER FACTOR OF PORCELAIN INSULATORS WITH ELECTOSTATIC WATTMETER

indication of the porosity of the porcelain. Results of this method show that the power factor of porcelain insulators has a direct relation to their dielectric strength and that, barring mechanical troubles or faulty design, the power factor depends upon moisture absorption as result of porosity.—*Electric Journal*, March, 1922.

Telegraphy, Telephony and Signals

The Rheinland Telephone Cable.—F. A. BUCHHOLZ.—To insure an absolutely reliable telephonic connection between Berlin and the industrial centers on the Rhine the German federal postal authorities decided in 1911 to lay a 600-km. cable across the empire. At that time this cable exceeded in length by far any existing telephone cable. Many original mathematical and experimental investigations had to be conducted to design the cable, which was calculated and built by the Siemens concern and the Felten-Guillaume works. Up to the fall of 1914 Hanover was reached. Then, on account of the war, the work had to stop until 1920, and the following year the line was completed, reaching Düsseldorf. The original pre-war cable contained seventy-eight double lines, but the later pieces were made with ninety-one and finally 207 double lines. The cable is equipped with a Pupin inductance coil about every 1,700 m. and every 30 km. an inspection hut is erected along the line. For its entire length the cable is in concrete ducts buried under highways. About 6,000 individual lengths of cable were needed, varying in length from 170 m. to 200 m. —*Siemens Zeitschrift*, February, 1922.

Miscellaneous

New Bearing Metal.—F. SCHNEIDER.—The Braunschweiger Hüttenwerk have developed a new bearing metal which consists of an alloy of suitable metals with graphite powder. It is claimed that the graphite is uniformly suspended throughout the entire thickness of the blocks and will stay so even after being remelted and cast around the shaft. A polished photo-micrograph is reproduced substantiating this claim. Trial runs with a shaft in different kinds of bearings show that with the new alloy a heating of only 20 deg. C. was observed after a run of one and one-half hours, while the other bearings under same conditions burned out or heated up to 90 deg. and 40 deg. respectively. Even if not oiled, the new metal prevents damage to the bearing.—*Elektrotechnik und Maschinenbau*, Feb. 5, 1922.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

LABORATORIES, RESEARCH, DIRECTORY OF.

A revised and enlarged directory of about 300 industrial and consulting research laboratories in the United States has been published. The information is classified alphabetically by the names of the companies, nature of research and names of directors. Under the first division are given the names and addresses of the companies, names of directors, number on staffs, chief lines of research and special equipment available. The foregoing information was issued in the *Bulletin* of the National Research Council, Vol. 3, Part 1, No. 16.

STEEL, ELECTRIC FURNACE VERSUS OPEN-HEARTH

A series of tests was completed during the month on samples of electric and open-hearth heats of silico-manganese spring steels carrying equal proportions of C, Mn, P, S and Si. The tests included microscopic examination, tensile test and determination of proportions of certain gases present, particularly nitrogen and hydrogen. In general, the microstructure of the electric steel was somewhat different from that observed in the open-hearth when both steels were subjected to the same heat treatment.—*Bureau of Standards, Washington, D. C.*

OIL, TRANSFORMER.

Research information of the following nature is now available on transformer oils: I. Properties, physical and chemical, of transformer oils: (1) Emulsions, water content; (2) specific heat, viscosity and thermal capacities; (3) flash and fire points; (4) boiling point; (5) volatility; (6) insulation value, variation with kind of oil and ascending series paraffine; (7) impurities and their effect on insulation value; (8) specifications for transformer oils. II. General problems: (1) Breakdown of oils (electrically)—(a) arc phenomena (disruption of oil), (b) magnetic precipitation of colloids to assist in the prevention of sludging; (2) breakdown of oils (chemically)—(a) catalytic oxidation of oils, (b) sludging rates—methods of measurements, (c) types of sludge; (3) solubility of gases in oils—air, CO_2, O_2, N_2, CH_4, C_2H_2; (4) prevention of sludging—(a) chemistry of oils and sludging phenomena, (b) inert gas space (central expansator), (c) conservator; (5) prevention of acidic condition of the oil. III. Circuit-breaker oils: (1) Oils for circuit-breaker purposes, characteristics; (2) electrical discharge in oils—(a) changes in oil (gases, liquids, solids), (b) deposition of carbon, (c) deposition of cupric oxide, (d) explosive limits of gases liberated; (3) pressure decomposition of oils, inert gases; (4) compounded dielectrics—(a) variation in breakdown value with time of arcing, (b) decomposition products; (5) reduction of fire hazard of circuit-breaker operation; (6) recovery of used circuit-breaker oils. IV. Mineral oils, compounded oils, vegetable and animal oils for miscellaneous electrical application.—*C. J. Rodman, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.*

LAMPS, INCANDESCENT, MEASURING PRESSURES IN.

In one of the papers to be presented at the meeting of the American Electrochemical Society, April 27, 28 and 29, Dr. Duncan MacRae of the Westinghouse Research Laboratory describes a new method for determining the pressure in a tungsten vacuum lamp by a McLeod gage. The measurements on lamps immediately after the process of exhaust (before "flashing") and after "flashing," as well as on life-tested lamps, are given. The operation known as "flashing" consists in lighting the lamp during the exhaust in the presence of phosphorus or other chemical substance.

CLUTCH, ELECTROMAGNETIC.

An electromagnetic clutch has been developed in which the torque between the driving and the driven shaft is transmitted by means of a magnetic flux in an air gap, without actual mechanical contact between the two. Such a clutch is suitable for a connection between a prime mover and an alternator, in case the latter is to be operated at times as a synchronous converter. The clutch is also adapted to the Diesel engine drive, to operating heavy machinery by electric motors and as a connection between a synchronous motor and its load.—*Sperry Gyroscope Company, Brooklyn, N. Y.*

INDUCTANCE COILS, HIGH-FREQUENCY RESISTANCE OF.

The resistance of short single-layer solenoids at high frequencies has been computed, taking into account the skin effect and the distributed capacitance of the layers. The computations have been applied to coil aërials and the results verified experimentally.—*G. Breit, Bureau of Standards, Washington, D. C.*

AUDION, OPERATING CHARACTERISTICS OF.

The grid-voltage plate-current characteristics are usually obtained experimentally for each value of the contemplated impedance of the plate circuit. It has been shown that these characteristics can be computed from the ordinary static characteristics of the tube which are measured with negligible impedance in the plate circuit.—*Lynde P. Wheeler, Yale University, New Haven, Conn.*

SPEECH, ENERGY DISTRIBUTION IN.

Human speech was received by an electrostatic transmitter whose voltage output, amplified about three thousand times, was impressed upon the grids of twin single-stage amplifiers. The output of one of the amplifiers was measured unmodified, while that of the other was limited by a resonant circuit to a narrow band of frequencies. The energy was measured by thermocouples. The results show a great concentration of speech energy at low frequencies.—*I. B. Crandall & Donald Mackenzie, Western Electric Company, New York, N. Y.*

MAGNETS, PERMANENT, EFFECT OF NASCENT HYDROGEN ON.

The magnetic moment of well-seasoned magnets undergoes a further reduction when the magnets are exposed to the action of electrolytic hydrogen. Newly manufactured magnets age rapidly under the action of the hydrogen. This aging process is accelerated by raising the temperature of the electrolyte in which the magnets are treated. At 60 deg. C. the final value of the magnetic moment is reached in less than an hour's exposure. A sudden fall in the magnetic moment occurs after a few minutes' exposure, which amounts in some cases to 19 per cent.—*John Coulson, Department of Physics, University of Pittsburgh, Pittsburgh, Pa.*

Suggestions for Research

INSULATOR, SELF-RINSING.

In localities where dry farming is practiced or where industrial dust and soot are deposited on the lower surface of high-tension insulators it is necessary to use larger insulators to reduce the number of flashovers. A driving rain washes the sides of an insulator but not its bottom surface. It is thought that by arranging proper baffles or a deflecting surface below an insulator a rainstorm could be made to wash the lower surface.

SUBSTATIONS, AUTOMATIC.

With the advent and growth of automatic substations for railway and industrial purposes the subject of economics of distribution has acquired a new interest. Old formulas and data do not always apply any more, and a new investigation is desired covering the most economical size of feeders and the best location and size of substations, assuming them to be of full automatic or semi-automatic type.

AUTOMOBILE HEADLIGHTS.

In view of more and more stringent regulations and anti-glare laws, some public garages have begun to specialize in adjusting headlamps as part of their service. Illumination specialists should develop simple photometric devices and a proper procedure for using them, in order that a service station attendant may be enabled to adjust headlamps to comply with given laws, irrespective of personal judgment.

DRY CELLS, REGENERATION OF.

During the war it was necessary in Germany to regenerate manganese dioxide used in dry cells, and some workable methods were developed. Several accounts of these methods have recently appeared in the German and Austrian electrical periodicals, and the subject is well worth investigation if the life of dry cells can be prolonged at a reasonable expense.

EDDY CURRENTS IN EMBEDDED CONDUCTORS.

R. E. Gilman presented a paper on this subject before the 1920 A. I. E. E. annual convention. Prof. W. V. Lyon presented a paper on the same subject before the 1921 annual convention and a second paper at the 1922 midwinter convention. The mathematical methods used by these two writers are different, and it is not clear whether or not the results check quantitatively in a given case. It is desired to unify the treatment and to obtain a set of tables or curves to enable a designer to use the results without going deeply into higher mathematics or spending much time in tedious computation. The whole subject is closely related to the temperature rise in machinery and is therefore of considerable interest to both the makers and users of large alternators.

DIRECT CURRENTS, LARGE, MEASUREMENT OF.

The magnetizing current of a choke coil or transformer is greater if a direct-current magnetization be superposed on the alternating-current magnetization. If the voltage and frequency of the alternating current be kept constant, the ammeter which indicates the idle current can be calibrated in direct-current ampere-turns. For carrying this method into practice it is only necessary to build round the bar carrying the direct current a choke coil to which alternating current is supplied. In order to avoid an additional alternating induction in the direct-current conductor, two choking coils may be used which generate opposed alternating emfs. in the direct-current conductor. This arrangement, which has been tried with success in Germany, should be of interest to electrochemical works and in testing large direct-current plants, because it is not necessary to disconnect the conductor.

BABBITT FOR BEARINGS, TIN VERSUS LEAD BASE.

Most operating engineers seem to favor a tin-base alloy, although lead-base alloys are considerably less expensive. Experience shows that satisfactory results can be obtained with the latter provided that they are poured under proper conditions, especially as to temperature. Thoroughgoing research as to the best conditions and the resulting properties of lead-base alloys as bearing lining is desired, in order that standard specifications may be prepared.

PIPES, STEAM, STRESSES IN.

In large power plants some bends on steam pipes are subjected to considerable mechanical stresses due to changes in temperature. Formulas and methods of computation of such stresses are desired.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Transportation Arrangements for N. E. L. A. Convention

TRANSPORTATION arrangements for the Atlantic City convention of the National Electric Light Association, to be held May 15 to 19, have been announced by Clarence L. Law, master of transportation. Delegates may secure round-trip tickets for a fare and a half. A *de luxe* special train is scheduled to leave Chicago May 14 for the convention with special Pullmans from Detroit and Cleveland.

Public Utilities Not Financing Enough by Common Stock

PUBLIC utilities are doing too much financing through bond issues and not enough through common stock, according to a statement made last week by the John Nickerson, Jr., organization of New York, which specializes in public utility securities.

"If public utility credit is to be maintained at its present favorable position," says the statement, "managers must give earnest thought to the matter of securing more partners in their enterprises rather than more lenders to them. An investigation into the relative amounts of note and bond financing compared with the stock financing being noted, month by month, in the sheets which we send will indicate that at present utilities are doing relatively too much borrowing. This is probably on account of the present investment market, but also probably due to the difficulties experienced in securing additional partners. After a certain amount of bond financing preferred stock can be sold, but ultimately even that form of financing becomes limited and additional capital must be furnished by common-stock holders."

Opposition to State Development of Water Power Growing in Maine

WATER-POWER policies formed one of the chief topics of discussion at the Republican state convention at Bangor, Me., last week, and evidence of a growing desire to keep hydro-electric development out of politics appeared in the give-and-take of platform framing. In the proposed Deering plank, which was fully discussed prior to the convention and at Bangor, appears the principal issue of one of the candidates for the gubernatorial nomination. This declared strongly against all further agitation on behalf of state ownership or operation and commended the work of the Maine Water Storage Commission and of the Maine Public Utilities Commission in safeguarding the public interest in natural resources. The final wording of the water-power platform was modified to avoid controversy and to emphasize the benefits of hydro-electric development under impartial scrutiny by the Legislature; but the long discussion over the proposed Deering plank clearly shows that opposition to state ownership agitation is gaining momentum. General agreement was voiced in the convention as to the soundness of the now celebrated Maine policy of prohibiting the exportation of hydro-electric energy to other commonwealths.

A Record in Railway Electrification in Europe

WHAT is said by the Italian press to be the longest electrified railway line in Europe was opened on March 20 between Genoa and Modane, via Turin, the total length being 272 km. (169 miles). Notwithstanding the unusual load carried by the first train run along the entire line, an average speed of 100 km. (62 miles) an hour was reached, even on the Dusino ascent, which is 7 miles long and has a 1.4 per cent grade.

The work of electrification of the line was executed by the State Railways. A delay occurred in the opening of the service, the government desiring to wait until all restrictions on the use of power were repealed. Conditions being now normal in northern Italy as to the production and distribution of power, the service on this line will be continued regularly.

The electrification of the new road cuts by two hours the time previously required between Modane and Genoa and is heralded as the beginning of an era in the work of electrification of the entire railway net in Italy.

Underwriters to Facilitate Investigation of New Electrical Products

THE electrical committee of the National Fire Protection Association, better known as the National Electrical Code committee, has appointed a new subcommittee known as the committee on new developments. The chairman is Dana Pierce, chairman of the main committee, and the members are the chairmen of the ten standing committees, among whom the general work of code revision is divided as follows: W. H. Blood, grounding; W. S. Boyd, signal systems, wireless and lightning; A. P. Denton, wiring standards and systems; W. Devereux, theaters, motion pictures and places of public assembly; J. C. Forsyth, fixture heaters, signals and lamps; G. S. Lawler, industrial applications; M. G. Lloyd, outside wiring, building supply and services; A. M. Schoen, generating stations and substations; M. Schreiber, cars and railways, and A. R. Small, devices and materials.

It is expected that through this channel it will be possible to provide for an orderly and well-understood investigation and field trial of new developments in the electrical field in their relation to the National Electrical Code in cases where the code does not expressly

prevent or prohibit the proposed appliance or method of installation. It is not the intention of the electrical committee that this new work shall supplant the work either of its regular standing or technical sub-committees or of Underwriters' Laboratories, but that it shall be supplemental thereto.

Beck Denounces Attacks on Ontario Hydro-Electric Commission

PROPAGANDA—this is what Sir Adam Beck, in a two-hour speech delivered at Toronto before the Ontario Municipal Hydro-Electric Association on March 21, termed the opposition to the Hydro-Electric Commission of the province. Referring to the speech of Premier Drury reported in ELECTRICAL WORLD for March 25, Sir Adam declared that if the extra cost of the Chippawa development and "lack of frankness" on the part of the Hydro-Electric Commissioners were the only faults disclosed, then the government was equally responsible, for the government had been advised of the extra cost as soon as the commission was informed by its engineers and the government had been consulted in all the developments. For himself he welcomed the coming investigation, which would establish for once and all the confidence of the people of the province in the loyalty and hard work of the whole staff of the commission. It was a monumental work, one unique in the history of the world. All knew that the propaganda against it was so extensive and so bitter that it would almost take away the reputation and certainly the courage of any man. It was cowardly in its attacks on the engineers and others of the working organization, men who had been slaves to the project for sixteen years, during which time there had never been the slightest basis for any intimation of wrongdoing. It was the success of the enterprise, to his mind, that had given birth to the attacks on it.

At the conclusion of his address a resolution expressing confidence in Sir Adam Beck and the Hydro-Electric Commission was adopted.

Niagara, Lockport & Ontario Power to Supply Jamestown

CONTROL of the Jamestown (N. Y.) Light & Power Company passed on April 1 to the Niagara, Lockport & Ontario Power Company of Buffalo, and central-station business in Jamestown will hereafter be carried on by the latter company through the medium of the Western New York Electric Company, which, with the same executive officers as the Jamestown Light & Power Company, has hitherto operated in Chautauqua Lake towns outside the city of Jamestown. Almet N. Broadhead retires as president of the two local companies, although retaining his place on the board of directors, and Fred D. Corey, president of the parent company, succeeds him.

The reorganization and recapitalization of the Western New York Electric Company, which was recently authorized by the Public Service Commission, includes an extension of its operations into all the counties of western New York as far east as Binghamton and north of Syracuse.

Jamestown has also a municipal electric plant.

Georgia Operator Scores State Operation of Water Powers

STATE ownership and operation of water powers was severely arraigned by Preston S. Arkwright, president of the Georgia Railway & Power Company, in an address recently before the Rotary Club of Rome, Ga. Mr. Arkwright said that he had no doubt that a state body would develop all of the state's water powers at once provided that body had the unlimited power of state taxation placed in its hands.

"They tell you," said Mr. Arkwright, referring to advocates of state ownership, "that the water power is being wasted; that the little kilowatt-hours are running in play down the river when every one of them ought to be made to work. Merely building a dam and installing a power house doesn't keep the water from wasting and the little kilowatt-hours from running away. If a water power development is made without reference to the possibility of utilizing it, the water soon rises to the top of the dam, flows over it, wastes down the river just as it did before. But the crime of it is that where you wasted only water before, these little runaway kilowatt-hours are taking dollars along with them, wasting with the water too. Getting the money, building the dam and the power house and the transmission line aren't all you've got to do. You've got to build the market along with them.

"If the power is overdeveloped, one of two things will happen; either the price to such consumers as you have must be increased to carry the interest on the unnecessary development, or if the consumers won't or can't be made to bear it, then this unnecessary charge must be carried by the owners. Under private ownership and public control this interest on the unnecessary development is not permitted to be passed on to the consumers.

"On the other hand, if it's done on behalf of the state, this unnecessary charge will be passed over to the taxpayers. Politicians, even though running a business enterprise, if running on the state's credit, can't 'bust' as long as the taxpayers of the state have a red copper cent left, but they can place new loads on already overburdened taxpayers so as utterly to destroy all hope and all courage in these individuals and have them all seeking a job where the state will take care of them."

Distribution of Commonwealth Edison Energy

ENERGY sales of the Commonwealth Edison Company for January and February increased 11 per cent over the same period last year, it was stated in a paper presented by L. A. Ferguson, vice-president of the Commonwealth Edison Company, before the mid-winter meeting of engineers held on March 22 under the joint auspices of the Western Society of Engineers and other engineering societies. A total of 1,700,000,000 kw.-hr. was sold for the year, which was distributed as follows: 163,000,000 kw.-hr. for residential lighting, 136,000,000 kw.-hr. for small stores, 65,000,000 kw.-hr. to small power users, 383,000,000 kw.-hr. to wholesale users, 87,000,000 kw.-hr. in refrigeration plants, 52,000,000 kw.-hr. for pumping water, and 771,000,000 kw.-hr. for electric railways, including the surface and elevated lines. This load was carried on a generating

capacity of 652,000 kw. and with a coal consumption of 2,140,247 tons, or 7,000 tons daily. The 1,500 electric trucks in Chicago alone purchased 12,000,000 kw.-hr. of energy. The investment for the entire system was $224 per kilowatt. Since 385,000 tons of coal were in storage, equivalent to seventy days' supply, Mr. Ferguson said that service would be kept up regardless of the coal strike.

General Electric Billed $221,000,000 in 1921

ALTHOUGH orders received in 1921 fell to $179,722,000 as compared with $318,470,438 for 1920, the sales billed by the General Electric Company in 1921 amounted to $221,007,991.64, which compares favorably with the 1920 figure of $275,758,487.57. The annual report further shows, as was naturally to be expected, a great falling off in unfilled orders at the close of the year. These, after eliminating cancellations, were $45,391,000 for large apparatus, as against $111,778,000 at the end of 1920. However, these figures are not altogether comparable because the accounts of the International General Electric Company are not included in the 1921 report. If the 1921 sales of $38,359,000 of the International company are added to the 1921 report or the 1920 sales of $32,775,000 taken from the 1920 report, then the figures read $259,366,000 in 1921, compared with $275,758,000 in 1920 if the foreign account is included, or, if excluded, $221,000,000 in 1921 and $242,983,000 in 1920.

When it is considered that the 1921 prices were, if anything, lower than those that held during 1920, it becomes apparent that the volume of work that went through the General Electric factories in 1921 was little if any less than that in the boom year of 1920.

Net sales billed*		$221,007,991.64
Less: Cost of sales billed, including operating, maintenance and depreciation charges, and provision for federal taxes		199,331,308.58
		$21,676,683.06
Sundry income:		
Interest and discount	$2,405,998.72	
Income from securities	2,967,918.89	
Sundry revenue	1,105,066.80	6,478,984.41
Net income		$28,155,667.47
Less: Interest and discount on debentures	$2,078,683.20	
Other interest payments	724,171.95	
	$2,802,855.15	
Investment securities reserve	$3,700,000.00	6,502,855.15
Profit available for dividends		$21,652,812.32
Less: 8 per cent cash dividends		13,409,522.00
Surplus for the year		$8,243,290.32
Surplus, Dec. 31, 1920	$70,048,610.57	
Less Sundry adjustments (net)	1,418,865.33	68,629,745.24
		$76,873,035.56
Less: 4 per cent dividends declared in stock		6,746,114.00
Surplus at Dec. 31, 1921		$70,126,921.56

* Net sales in 1920, $275,758,487.57

That conditions are getting much better, moreover, is indicated by the statement that the orders received by the company for the first quarter of the current year have been at an annual rate of $200,000,000.

Inventories of goods on hand or in consignment were taken at the lower level of cost or market and are carried at $64,848,188.87, as against $118,109,173.99 at the close of 1920. Customers' notes and accounts receivable showed a stronger position, being carried at $52,514,901.62, as compared with $64,962,682.28 at the end of 1920. Investment securities are now carried at $75,326,382.17, an increase of approximately $12,000,000. As usual, the patent account is shown at a net value of $1.

It is interesting to note that the number of square feet added to factory floor space in 1921 was exceeded only in 1912 and then by but a few square feet. The 1921 total was 23,201,000 sq.ft. owned and 1,841,000 sq.ft. leased, or 25,042,000 sq.ft. all told. This was an increase over the previous year of slightly more than 2,300,000 sq.ft.

The income account for the year 1921 is shown in the accompanying table.

Cohoes Power 6 per Cent Bonds Issued at a Premium

A NEW issue of $675,000 first-mortgage 6 per cent bonds of the Cohoes (N. Y.) Power & Light Corporation came out this week at 101½, yielding 5.75 per cent. These bonds are callable on thirty days' notice at 105. That so small an issue could be floated for such a high price is excellent evidence of the strength of the electric light and power bond market.

The Cohoes company has a 40,000-hp. hydro-electric plant on the Mohawk River at Great Cohoes Falls and a gas plant at Cohoes. It also leases land to industrial plants which as a part of the lease agree to purchase a certain minimum amount of power.

Another interesting issue of the week was $3,500,000 of series B unifying and refunding mortgage 6 per cent non-callable thirty-year bonds of the San Joaquin Light & Power Corporation, which was floated at 99½, yielding 6.05 per cent.

Both of these prices compare favorably with that received early in the week for the $15,000,000 non-callable thirty-year bonds of the Province of Ontario, which operates the largest government-owned power system in the world. The bonds came on the market at 99¼, yielding 5.05 per cent.

Bidders for Muscle Shoals Likely to Be Asked to Increase Offers

A SERIES of "informal conversations" between members of the House military affairs committee which will have far-reaching results has been in progress this week in connection with the committee's investigation of the Muscle Shoals water-power and nitrate projects. These preliminary exchanges of views, which have taken place in executive session and upon which members of the committee refuse to talk for publication, may or may not lead to a reappearance before the committee of the representatives of Henry Ford, the Alabama Power Company, Frederick E. Engstrum and Charles L. Parsons. It is authoritatively stated that they may lead to the appearance before the committee for the first time of Mr. Ford in person, and there is every indication that unless Mr. Ford does personally appear and materially alter and increase his offer it will not stand much, if any, chance of being favorably reported by the committee.

Although members of the committee refuse to talk for publication, it is understood that almost all of them are agreed that Mr. Ford must eliminate from his proposal the Gorges plant on the Warrior River. There is ground for the belief, too, that in order to receive

consideration he must materially increase his first offer of $5,000,000. It is stated that the increases suggested in the committee run to a figure as high as $25,000,000. It is understood also that the conversations in some quarters have developed a definite desire that there shall be furnished by Mr. Ford a certain, fixed, specific guarantee that he or his company, heirs or assigns will make and continue to make fertilizer irrespective of whether it is now thought that it can be made at a profit, the question of cheap fertilizer for the farmers having been one of the principal elements injected into the Ford offer as a reason for its acceptance. It is understood that there is present in the committee a feeling that if Mr. Ford desires to receive consideration he must see to it in any final offer he may make that the government will be put to no permanent expense whatever in connection with turning the projects over to him, and also that should a suit be brought by the Air Nitrates Corporation to enforce its contract with the government for the purchase of Nitrate Plant No. 2, Mr. Ford must stand the expense of that suit and must defend it.

NO CHANCE FOR FORD OFFER AS IT STANDS

What these informal committee conversations will lead to next week, when it is expected that the atmosphere will have cleared, it is not possible to say at the moment that this is being telegraphed from Washington. But it is evident from the few points mentioned that there is absolutely no chance of the Ford offer being favorably reported by the military committee. The Ford representatives in Washington are apparently not united on the question of whether or not Mr. Ford will make any modifications or increase of his offer. Mr. Ford's chief engineer, W. B. Mayo, who has represented him formally before the committee, arrived in Washington at the end of the week.

In the Senate committee on agriculture and forestry Senator Norris, the chairman, not only began his hearings on the various proposals for Muscle Shoals, but drew, introduced into the Senate and had referred to his committee a bill of his own to provide at Muscle Shoals for the manufacture of explosives for the army and navy, to provide for the manufacture of fertilizer for agricultural purposes, and to incorporate "the Federal Chemical Corporation," a government-owned and operating company, to take over the water-power projects and nitrate plants at Muscle Shoals. Senator Norris also carried out his plan, announced in the ELECTRICAL WORLD last week, to pave the way for a temporary government appropriation of $7,500,000 to go on with construction work at Muscle Shoals for one year. This was done by attaching a rider to the army appropriation bill which is now in the Senate and which has been passed by the House. It is doubted, however, whether the House will accede to the amendments.

It is expected that the hearings in the Senate will continue for some time. As this is written most of the testimony being presented before the Senate committee is by the army officers in charge of construction, design and maintenance at Muscle Shoals, and much of it follows along the line of similar testimony presented at the House hearings, except that Senators are directing questions toward the feasibility of Senator Norris' plan for a temporary appropriation. Many of the questions also bring out the fact that members of the Senate committee believe that Nitrate Plant No. 1 (the Haber process plant) should be maintained.

New York Township to Illuminate All Its Highways

THE township of Amherst, N. Y., which is adjacent to Buffalo, has decided to illuminate all the highways within its borders and has entered into a contract with the Buffalo General Electric Company for a lighting system for its entire road mileage, a total of about 100 miles. This is the first instance, so far as can be recalled, in which a township has decided to light all its roads. The work will be spread over three years, and the complete installation will consist of between 1,000 and 1,500 units, including those to be placed along the portion of the Buffalo-Niagara Falls Boulevard, which will be lighted jointly by the Buffalo General Electric and the Tonawanda Power Companies.

The contract calls for the installation of 212 units at once, the others to be added as directed by the supervisor of the township. These first units will be placed along 5 miles of the east-and-west highway leading eastward through the township from the Buffalo city line, one of the great trunk motor-travel routes of the United States, as well as along a number of parallel stretches of improved roads and crossroads. Work on the main-road installation has already been started beginning at the Buffalo city line.

The new General Electric highway-lighting units will be used with 250 cp. gas-filled lamps. The units to be placed along the main road will be spaced at intervals of approximately 400 ft., 30 ft. above the surface of the highway and about 20 ft. back from the shoulder of the road. On the less important highways, such as dirt roads, it is planned to space the units 600 ft. apart, but the lamps will be of the same size and type.

Pacific Power & Light Asks Permit to Develop 650,000 Hp.

THE Pacific Power & Light Company of Portland, Ore., has applied to the Federal Power Commission for a preliminary permit to cover a large power project on Snake River. The proposal is to erect ten concrete dams between the Grande Ronde River and a point 20 miles below Homestead, Ore. In that distance a fall of 600 ft. would be developed, according to the application. The project, it is estimated, will develop 400,000 hp. of primary power. The plan is to install the equipment necessary to generate 650,000 hp.

G. M. Thomas of Marianna, Fla., has applied for a preliminary permit covering a dam and power house which he proposes to build on the Chipola River, 11 miles below Marianna. The primary power of the project is estimated at 2,000 hp. It is proposed to install 6,000 hp.

The Black Mountain Telephone Corporation of Black Mountain, N. C., has applied for a license to cover a transmission line across the Boone National Forest.

The Great Western Power Company of San Francisco has applied for a preliminary permit for the diversion of waters from Bucks, Pine, Rock, North Valley, Little Kinshew and Crane Valley Creeks to a power house to be built on the north fork of Feather River. The amount of primary power which will be developed is estimated at 24,000 hp., and it is the intention to install equipment rated at 30,000 hp. The power is to be used for public utility purposes.

The California-Oregon Power Company of San Fran-

cisco has applied for a license to cover the construction of a transmission line across three tracts of public lands in Shasta County, Cal.

James H. Mays and Harry L. Gandy, Salt Lake City, have asked for a preliminary permit to cover a diversion dam, conduit and power house on Huntington Creek, Emery County, Utah. The power is to be used for mining purposes. The primary power available is estimated at 400 hp. It is the intention to install equipment to generate 1,000 hp.

Merger of Large Tennessee Power Interests Proposed

STEPS are being taken toward the formation of the Tennessee Electric Power Company to effect a consolidation of the companies controlled by the Tennessee Railway, Light & Power Company with the Chattanooga & Tennessee River Power Company. The properties of these companies have been operated as one system, and it is now proposed to bring them together as nearly as possible into one ownership, thus providing for the funding of current floating indebtedness and for the permanent financing of necessary improvements.

The existing companies all have large floating debts. Their securities do not command a ready market and their financial structures and the securities available for sale, those interested in the properties state, do not admit of funding their floating indebtedness nor of future financing on reasonable terms under existing conditions.

The Chattanooga & Tennessee River Power Company owns the Hales Bar plant on the Tennessee River. This plant was built by the Brady interests, which control the company. It has 50,000 hp. installed, which is leased to the Tennessee Power Company for a term of years. The other properties in the merger are under E. W. Clarke management. The Tennessee Power Company owns and operates two hydro-electric plants in the Ocoee River having a combined capacity of 45,000 hp., a 13,000-hp. water-power station at Great Falls and a 20,000-hp. steam station at Parksville. It also controls the steam stations of the Nashville, Knoxville and Chattanooga companies, with an aggregate capacity of 29,000 hp., making a total rating of 157,000 hp.

Another 30,000 Kw. for Philadelphia to Take Care of Anticipated Business

TO TAKE care of new business, the Philadelphia Electric Company has started work on the installing of a new 30,000-kw. generator at its station on the Delaware River at Beach and Palmer Streets. A contract has been awarded to Stone & Webster, Inc., for the construction of the preliminary foundations, consisting of tunnels, wharves and other necessary foundations. The generator, when completed, will bring the total capacity of the plant up to 90,000 kw.

Joseph B. McCall, president of the Philadelphia Electric Company, in speaking of the work to be done, said: "Anticipated new business has led the Philadelphia Electric Company to begin work on the installing of a new generator at its Delaware River station. The preliminary work, however, does not necessarily mean that the contract for the building of the entire structure will be let in the near future."

Senate Reports Out Elastic Tariff with Foreign Valuation

AFTER nearly nine months of study the Senate finance committee has reported out an electric tariff. To give the measure the flexibility which the Senate committee believes to be necessary, fundamental changes had to be made in the bill which was passed by the House of Representatives last July.

The Senate committee based ad valorem rates on the foreign values of imported merchandise. The American valuation plan as embodied in the bill passed by the House was abandoned because of the limited number of exactly comparable domestic and foreign products and the difficulty and probable litigation involved in defining comparability to the satisfaction of importers, domestic manufacturers and customs officials.

Chairman McCumber states that the plan of assessing ad valorem duties on the American selling price of the imported article was abandoned largely because of the unstable basis for assessing duties growing out of the importers' profits when selling in the American market. Tariff elasticity has been provided, the committee believes, by authorizing the President to modify rates within prescribed limits, to change the basis of ad valorem duties on certain items from the foreign value to the value of the domestic article in the American market, to impose penalty duties and prohibit the importation of particular goods, and to impose additional duties against any country which discriminates against the United States.

Generally speaking, the Senate rates are higher than those recommended by the House or now in force under the Underwood tariff. A parallel-column analysis of these three tariffs as they pertain to electrical goods or raw materials entering electrical production follows:

	Senate	House	Underwood
Incandescent lamps and bulbs, per cent	70	35	30
Insulated wire and cable, per cent	40	30	15
Storage batteries, plates, etc., per cent	45	30	20
Wood poles, per cent	10	10	10
Molded insulators and other insulating material of india rubber, per cent	10	10	10
Molded insulators of shellac, copal or synthetic phenolic resin, per cent	50	30	15
Carbons and electrodes, per cent	45	35	30
Graphite, amorphous, per cent	10	10	Free
Insulating machinery, per cent	50	..	20
Mica, unmanufactured:			
Under 15 cents per pound, per lb.	4c.	4c. + 17%	4c.
Over 15 cents per pound, per lb.	25c.	4c. + 17%	25c.
Cut or trimmed, per cent	30	10c. + 17%	30
Plates and built-up, etc., per cent	40	10c. + 17%	30
Scientific and laboratory instruments, per cent	55	40	Free
Scientific glassware, per cent	75	..	45
Asbestos crude	Free	Free	Free
Asbestos electrical paper not exceeding 0.05 in. in thickness, per cent	8	8	10
German silver, per cent	20	20	15
Brass rods, per pound	4c.	4c.	20%
Seamless brass tubing, per pound	8c.	8c.	20%
Brazed brass tubing, per pound	12c.	12c.	20%
Bronz rods and sheets, per pound	4c.	4c.	20%
Bronz tubes and sheets, per pound	8c.	8c.	20%
Quicksilver, per pound	25c.	35c.	10%
Nickel pigs, per pound	3c.	5c.	10%
Nickel bars and sheets, per cent	25	30	20
Tin bars and pigs, per pound	Free	2c.	Free
Copper unmanufactured	Free	Free	Free
Aluminum, per pound	5c.	5c.	2c.
Aluminum prepared, per pound	9c.	9c.	3½c.
Seamed steel tubes, per pound	¼—1¼c.	¼—1¼c.	20%
Flexible metal tubing, per cent	35	25	20
Pliers, pincers, nippers:			
4 in. to 6 in., each	10c. + 50	10c. + 25	30%
Over 6 in., each	12c. + 50	12c. + 25	30%
Steam engines, per cent	20	15	15
Lodestones	Free	Free	Free
Machine belting			
Cotton, per cent	30	20	15
Leather, per pound	40c. + 5%	Free	Free

American Welding Society's Annual Convention April 26-29

THE annual meeting of the American Welding Society will take place at the Engineering Societies Building, New York, April 26-29. Pressure-vessel welding will be discussed during the morning of April 26, while the afternoon will be given over to meetings of the welding wire specifications committee and the resistance welding committee. The next afternoon the committee on specifications for steel to be welded will meet.

The first technical session will be held in the evening of April 27, with the following program: "Welding of Heavy Copper Plate," by A. S. Kinsey; "Electric Welding of Dredge Pipes," by J. H. Nead and R. L. Kenyon; "Thermit Welding," by J. H. Deppeler. The next afternoon after electing officers plans for future activities will be discussed.

The morning of April 28 will be given over to the electric arc-welding committee, while the next morning will be devoted to simultaneous sessions by the committee on training of operators and the committee on welding of storage tanks.

Appellate Court Again Upholds General Electric Lamp Patents

THE United States Circuit Court of Appeals for the Second Circuit has handed down an opinion written by Justice Charles M. Hough in the suit of the General Electric Company against F. Alexander and the Alpha Laboratories, Inc., affirming the previous decree of the District Court which held the Just and Hannaman patent for the tungsten-filament lamp and the Langmuir patent for the gas-filled type C lamp valid and infringed by the defendants.

The decision just rendered is considered of great importance since the defense was raised that the Just and Hannaman patent was not infringed because the tungsten-filament contained a small proportion of thoria. The conclusion reached by the court is that the presence of thoria does not make the lamps any the less an infringement of the patents.

Topics of Electrical Interest to Come Up at Spring Meeting of A. S. M. E.

FOR the spring meeting of the American Society of Mechanical Engineers, to be held at the Piedmont Hotel, Atlanta, Ga., from May 8 to May 11, a tentative program has been adopted which includes a number of topics of interest to electrical engineers. On Tuesday, May 9, a material-handling session will be held, with a paper by F. L. Leach on "Material-Handling Equipment as Used in the Iron and Steel Industry." In the general session on that day Alfred Cotton will discuss "Accuracy of Boiler Tests" and J. Stumpf and C. C. Trump "Turning Exhaust Losses Into Work in Reciprocating Engines."

There will be a fuel session on Wednesday, May 10, with papers on "Reduction of Fuel Wastes in the Steel Industry," by F. G. Cutler; "The Control of Boiler Operation," by F. A. Uehling, and "Boiler-Room Performance and Practice at Colfax Station, Duquesne Light Company," by C. W. E. Clarke. In the general session Major J. K. Clement will present a paper on the Muscle Shoals nitrate plant.

On Thursday, May 11, the power session program will include papers on "Power Development in the Southeast," by Charles G. Adsit; "Economics of Water-Power Development," by C. A. Mees, and "New Developments in Hydro-Electric Design," by John A. Sirnit. There will also be presented a report upon efficiency tests of a 60,000-kw. cross-compound, triple-cylinder steam turbine, by H. B. Reynolds and W. F. Hovey.

For a symposium on welding, also to be held on Thursday, these papers are scheduled: "The Strength of Electrically Welded Pressure Containers," by R. J. Roark; "Some Principles of the Construction of Unified Pressure Vessels," by S. W. Miller; "Steel for Forge Welding," by F. N. Speller, and "Tests on Welded Cylinders," by E. A. Fessenden and E. J. Bradford.

Two More Industrial Heating Courses Begin April 24

INTEREST in the courses in industrial electric heating which have been conducted this year by the Westinghouse and General Electric companies under the auspices of the industrial heating division of the Power Sales Bureau of the National Electric Light Association has increased so much of late that two more courses will be given this spring. These will be parallel and will run from April 24 to May 6 at the

ENGINEER INSTRUCTORS AND STUDENTS AT INDUSTRIAL HEATING COURSE AT MANSFIELD, OHIO

Mansfield (Ohio), Pittsburgh and Newark (N. J.) works of the Westinghouse company and at the Schenectady and Pittsfield works of the General Electric Company. Fifty-seven men took the first five courses.

As previously outlined in the ELECTRICAL WORLD, these courses are designed to give the central-station power engineer an up-to-the-minute knowledge of the development, characteristics and applications of industrial electric heating service, supplementing lectures, factory and laboratory instruction by expert engineers with visits to installations. The manufacturing companies furnish this instruction without charge to those registering. This movement represents a practical attempt on the part of the N. E. L. A. committee and the manufacturers to put in the hands of the power sales engineer concrete information which will equip him to attack the industrial electric heating problems of his company's territory with understanding.

V. M. F. Tallman, 201 Devonshire Street, Boston, is chairman of the N. E. L. A. committee having this matter in charge, and additional registrations will be received by him up to the limit practicable.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

University of Illinois Undergraduates to Hold Electrical Show.—The eighth biennial electrical show of the electrical department of the University of Illinois, Urbana, will be held on April 20, 21 and 22. More than 300 students have been working since October in preparation for this show, which is the largest affair of its kind held in the country.

Rate Decrease in Indianapolis.—The electric rate reduction in Indianapolis ordered by the Public Service Commission March 11 became effective April 1. The new schedules, which supersede all others and all special contracts and practices, will decrease rates generally in the city. Residence rates drop half a cent a kilowatt-hour, and homes are placed on a room basis instead of a socket basis as now.

Scholarships for Trade and Technical Teachers.—The director of vocational and extension education, State Department of Education, Albany, N. Y., calls attention to the annual award of twenty-five industrial teachers' scholarships to qualified persons. The men selected spend one year in the Buffalo State Normal School preparing to teach their trade to apprentices, boys in public trade schools and men attending evening trade extension classes. Scholarships are worth at least $1,000.

Water Power in Jugoslavia.—Announcement is made of the formation of a syndicate for the development of hydro-electric plants in Jugoslavia to be worked in connection with the large government projects of this nature. The syndicate is to study the water powers of the Bosna and Drina Rivers. The erection of an 8,000-hp. power station near Modric and of a 20,000-hp. station on the lower Drina has been agreed upon. It is said that the capital can be raised in the country itself.

Eastern Connecticut Power Company Purchases Putnam Utility.—The purchase by the Eastern Connecticut Power Company, Norwich, of the Putnam Light & Power Company has been approved by the Connecticut Public Utilities Commission. The Putnam company operates steam and hydro-electric plants aggregating 2,320 kw. and is interconnected with the Eastern organization's lines. It is expected that under the transfer of ownership the production of both systems will be stabilized and more efficient operation secured. The Eastern Connecticut company supplies energy to various utilities, municipalities and other users in the region between New London and Putnam.

War Department Radio Net.—The War Department, which has now approximately fifty radio stations within the continental United States, has established a radio net from Washington to the Ninth Corps area headquarters in California for the distribution of army orders and messages under the supervision of the Signal Corps. Eight of the nine areas have established separate nets for their own work.

Edinburgh University May Become Center of Hydro-Electric Engineering Training.—Agitation of water-power development in the Scottish highlands has led to a movement, backed by the Edinburgh Chamber of Commerce, to promote training of engineering students in the special field of the hydro-electric art and it is thought that the University of Edinburgh may become a center of teaching along this line, through the employment of specially qualified lecturers and the installation of apparatus and plant.

Proposed Consolidation in Wisconsin.—The Wisconsin Utility Company and the Wisconsin Power, Light & Heat Company have applied for permission to consolidate. These two companies furnish the entire power for southern and western Wisconsin. Under the proposed merger, the Wisconsin Power, Light & Heat Company would assume all present outstanding bonds and debts. There would be no change in ownership, the principal result being centralization of control. The new concern, if permission is granted to consolidate, will, it is promised, enlarge and greatly extend its properties.

Yale Appoints Lecturers on Electrical Subjects.—Yale University, New Haven, Conn., has announced the following appointments of graduate lecturers in the department of electrical engineering: Lyman F. Morehouse, development engineer of the American Telephone & Telegraph Company; Allan D. Colvin, assistant general manager of the Hartford (Conn.) Electric Light Company; Philip Torchio, chief electrical engineer of the New York Edison Company; Percy H. Thomas, consulting electrical engineer, and Arthur B. Leslie, general manager Narragansett Electric Lighting Company, Providence, R. I.

Radio Used to Make "Talking Movies" a Fact.—By the use of radio telephony to transmit the voices of actors it is claimed that at last a practicable method of synchronizing speech and action in motion pictures has been devised. Recent experiments at Chicago by the Rothacker Film Company are reported to have been entirely successful. The actors who are to furnish the vocal part of the entertainment are assembled at the broadcasting station, where a master projection machine furnishes the cues. A device has been invented, it is said, whereby any number of projection machines at the theaters can be operated in synchronism with the master machine, thus insuring that the spoken part of the play will keep even pace with the development of the plot.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month

Coming Meetings of Institute Sections.—Section meetings of the American Institute of Electrical Engineers are scheduled as follows: April 18, Erie, Pa., "Electrical Measurements and Meters," by C. P. Yoder; April 18, Cleveland, "Automatic Substations," by L. B. Bale, Cleveland Railway Company; April 20, Fort Wayne, Ind., "The Practical Uses of the X-Ray," by Dr. C. C. Grandy; April 21, Baltimore, "Wireless Telephony," by E. F. W. Alexanderson, General Electric Company, and L. W. Chubb, Westinghouse Electric & Manufacturing Company; April 24, Toronto, "Rocky Mountain Trails to Mount Robson," by Prof. A. P. Coleman; April 27, Atlanta, "Modern Dam Construction," by R. S. Burroughs, Ambersen Construction Company; April 28, Salt Lake City, "The Manufacture of Dielectric Porcelain," by A. M. Jackson, Locke Insulator Corporation; May 5, Vancouver, B. C., "The Alternating-Current Potentiometer," by James Stott.

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Pittsburgh, April 22; Philadelphia, April 18 and May 6; Chicago, May 8; Cleveland, May 8.
A. I. E. E. Section Meetings—Cleveland, April 18; Erie, April 18; Fort Wayne, April 20; Baltimore, April 21; Toronto, April 24; Atlanta, April 27; Utah, April 28; Vancouver, B. C., May 5.
A. I. E. E. Spring Convention—Chicago, April 19-21. (For program see issue of April 1, page 644.)
Tri-State Water and Light Association—Spartanburg, S. C., April 19-21. (For program see issue of April 1, page 648.)
American Association of Operating Engineers—Columbus, Ga., April 20-22.
American Physical Society—Washington, April 22.
American Electrochemical Society—Baltimore, April 27-29.
Missouri Association of Public Utilities—Columbia, Mo., May 4-6.
A. S. M. E. Spring Meeting—Atlanta, May 8-11.
Florida Engineering Society—Daytona, Fla., May 15-16.
N. E. L. A. Annual Convention—Atlantic City, May 15-19.
National Electric Credit Association—Detroit, May 18-19.
Electrical Supply Jobbers' Association—Hot Springs, Va., May 24-26.
N. E. L. A. Geographic Divisions—Southwestern, San Antonio, May 3-6; Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15; Iowa Section, Lake Okoboji, June 20-22.
Electric Power Club—Hot Springs, Va., June 5-7.
Canadian Electrical Association—Ottawa, Ont., June 15-17.
Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25.
American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.
A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30.
American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.
Ohio Electric Light Association—Cedar Point, Ohio, July 11-14.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Rates Should Be Definite and Certain.—The Public Utilities Commission, in placing a public utilities service customer on the standard schedule of rates, notwithstanding a long-term contract, should according to the Supreme Court of Utah in Utah Hotel Company vs. Public Utilities Commission, a case in which steam-service rates were concerned, make an express finding as to whether the service is to be furnished at a wholesale price, or at least make the rate to be paid by such customer definite and certain. (204 Pac. 511.)*

Court Not Bound by Conclusion of Commission on Undisputed Evidence.—The Supreme Court of Utah, annulling an order of the Public Utilities Commission of that state which closed a private crossing over a railroad in the erroneous belief that it was a public one (Bamberger Electric Railway Company vs. Commission), asserted that, although the court is ordinarily bound by the findings of the commission when the evidence is conflicting or admits of more than one inference, the findings by the commission on undisputed evidence which admits of only one inference is a mere conclusion of law, not binding on the court. (204 Pac. 314.)

Powers of West Virginia Commission.—In Wheeling Steel Corporation vs. Public Service Commission of West Virginia, the Supreme Court of Appeals of that state has found that the commission has no authority to entertain a complaint for the purpose of determining that a public service corporation has charged rates in excess of those authorized, when it appears that the rate which it is contended was applicable and which such corporation is charged with exceeding is no longer applicable to the service rendered, and the decision sought could only be for the purpose of fixing a basis for recovery of the amount of the excessive charge. (110 S. E. 489.)

Court Refuses to Grant Rate Increase Pending Determination of Appeal from Commission Ruling.—The Okmulgee Gas Company having brought suit against the State of Oklahoma to reverse a decision of the Corporation Commission denying its application for increased rates, the Supreme Court of Oklahoma found that while the commission has power to agree to an increase of rates over those allowed by a city franchise, it is not compelled to grant such an increase unless the facts disclose that the franchise contract is confiscatory or that during its entire term the rate will be unprofitable. The facts adduced by the plaintiff were held to be insufficient to justify the court in granting the application for supersedeas and permission to collect the increased rates pending final determination. (204 Pac. 443.)

Utility Entitled to Fair Return but No More.—In Northern Illinois Light & Traction Company vs. Illinois Commerce Commission ex rel. City of Ottawa, the Supreme Court of Illinois, remarking that the Legislature cannot compel a public utility to serve without reasonable compensation, said further that, although a utility is entitled to a rate which will yield a fair return and is not merely non-confiscatory, the public, on the other hand, is entitled to demand that the rate be no more than will yield a fair return. The fact that a corporation is making a profit on its light and power business does not, the court held further, authorize a requirement that it operate its street-railway system at a loss. (134 N. E. 142.)

Utility Operating Under Ordinance Fixing Minimum Charge Cannot Make Additional Readiness-to-Serve Charge.—The Supreme Court of Ohio decreed, in Ashtabula Gas Company vs. Public Utilities Commission, a delayed case in which an ordinance of the city of Ashtabula was in question and in which the city, as intervener, joined the gas company in asking for a modification of the commission's order, that where a minimum charge for service to be rendered is made or prohibited by the ordinance under which a public utility is operated the utility is not authorized to make a readiness-to-serve charge to be paid in addition to or substituted for the just and reasonable rate fixed for the rendering of the service. (133 N. E. 915.)

What Constitutes an Injury "Arising Out of and in Course of Employment."—The chief engineer of the Dakota Light & Power Company undertook to assist workmen who were removing a wall preparatory to the enlargement of the power house and brought down a part of the wall upon himself, losing his life in consequence. The board of arbitration and the Industrial Commissioners of the state awarded compensation to the relatives of the man killed, but the Supreme Court of South Dakota has sustained the lower court (Wilson vs. Dakota Light & Power Company) in reversing this action on the ground that the accident did not arise "out of and in course of employment." "There was no more justification," the court held, "for his attempt to assist in tearing down the wall than there would have been for one of the bricklayers to have gone into the engine room and undertaken to operate the engines or dynamos." A dissenting judge deprecated the "hopeless confusion" that has been caused by attempts to define the statutory phrase quoted above and declared for a liberal interpretation of the law. (186 N. W. 828.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Investment Cost as Basis for Valuation Condemned.—The Indiana Public Service Commission, in considering the valuation of the Indiana Railway & Light Company, said of investment cost as a basis for rates: "It is urged that the value of a public utility now is the number of dollars actually invested in the property. There is no reason why such a rule should be applied to public utility property when it has never been applied to the measuring of the value of any other kind of property under any circumstances. . . . Basing the value of a public utility on the actual investment or original cost would be proper and equitable if it were practicable to have a fluctuating rate of return which would vary from, say, 6 to 10 per cent. In that case the actual investment might always be used and the return, measured in purchasing power, kept the same by varying the rate of return. It is not expedient to do that, and it is therefore necessary to protect the interests of the public as a whole by recognizing the greater or less value of a dollar in measuring the value of the property."

Service Extensions on Customer's Demand.—In granting an application made by the Canon Reliance Coal Company for an order directing the Trinidad Electric Transmission, Railway & Gas Company to install immediately the additional equipment necessary to meet an increased demand of the coal-mining company for electrical energy, the Colorado Public Utilities Commission held: (1) That a contract entered into between a public utility and a consumer relating to service extensions is material evidence in determining whether added service should be ordered, although the commission will not undertake to enforce specific performance of such a contract; (2) that such a demand by a power consumer is a demand for additions and betterments rather than a new extension in a new field; (3) that, as a general rule, when a utility has voluntarily entered a field and undertaken to serve the customers therein it must thereafter continue to serve them adequately, which naturally involves the furnishing of reasonably adequate facilities and all necessary extensions or betterments, although the income may not at once produce a return on the added investment. The coal-mining company was ordered to bear a portion of the burden of raising the additional capital necessary, the same to be refunded monthly out of the revenues received from power bills.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

S. M. Kintner has been appointed manager of the research department of the Westinghouse Electric & Manufacturing Company, succeeding C. E. Skinner, who has been appointed assistant director of engineering in the Westinghouse company. Mr. Kintner's workplace will be the research laboratory at East Pittsburgh, Pa. He was graduated from Purdue University in 1894, immediately after graduation spending a year in telephonic construction and operation, after which he was instructor and later professor in the department of electricity of the Western University of Pennsylvania, now the University of Pittsburgh. In 1903 he joined the forces of the Westinghouse Electric & Manufacturing Company as research engineer concerned with high-tension phenomena, lightning arresters, line and apparatus protection and so forth. Four years later he became connected with the railway engineering department and had charge of alternating-current railway-motor design. He held this position until 1911, when he joined the National Electrical Signaling Company as general manager. During this period he made telephonic-interference investigations and also investigations of alternating-current electrolysis. In 1917 this company was reorganized as the International Radio Telegraph Company, and Mr. Kintner served at different times as its vice-president and president. He again became associated with the Westinghouse Electric & Manufacturing Company in September, 1920, and since that time he has been engaged in research and engineering studies in the development of radio apparatus. He has just returned from an extensive trip through Europe made to study engineering developments in foreign countries.

S. M. KINTNER

John V. L. Hogan, consulting engineer and specialist in electrical and patent matters, has moved his office to 41 Park Row, New York City. Mr. Hogan has played a prominent part in the development of the radio telephone and was the first person to build and operate a radio-telephone broadcasting station, transmitting bulletins and music by wireless on daily programs. He was born in Philadelphia and was graduated from the Sheffield Scientific School, Yale University. He entered the radio field as chief laboratory assistant to Dr. Lee de Forest in the development of the grid audion receiver and amplifier and the radio telephone. In 1909 he became connected as telegraph superintendent with the National Electrical Signaling Company and was later chief of the operation, inspection and erection department of that company. When this company was reorganized as the International Radio Telegraph Company, Mr. Hogan was appointed chief research engineer, a position he held until 1917, when he was promoted to be commercial manager and later manager, having until 1921 executive supervision of design, manufacture of apparatus, construction of stations and sales and operation of the company. He has obtained a large number of patents both in the United States and foreign countries on radio-telegraph and radio-telephone transmitting and receiving apparatus, and he has applications pending in the allied electrical lines. He has contributed extensively to the technical press, especially on radio communication.

J. V. L. HOGAN

H. A. Lane, for several years manager of the Oklahoma Utilities Association, has been selected to direct the organization and activities of the joint committee on business development of the National Electric Light Association. Mr. Lane will be stationed at the association headquarters, New York City, and will be the executive operating under the direction of the joint committee to co-ordinate the activities of the association with those of other associations and organizations. He was born in Rochester, Wis., in 1881 and was graduated from the University of California. Since graduation Mr. Lane has been associated in an administrative and organizing capacity with the Alameda County Chamber of Commerce, the Alaska-Yukon Pacific Exposition, the Chamber of Commerce of Los Angeles, the Panama-Pacific Exposition, the Missouri Pacific Railway Company and the Chamber of Commerce and Oklahoma County Free Fair. Mr. Lane's previous experience therefore supplies an excellent background for the direction of the business development committee of the N. E. L. A.

H. A. LANE

W. F. Bellinger has been appointed superintendent of operations of the Georgia Railway & Power Company, Atlanta. Mr. Bellinger has been connected with this company for the last sixteen and a half years and has filled many posts in the operating department.

F. J. Bullivant, who was appointed chief engineer of the Valley Electric Company of St. Louis on Jan. 1 last, was born in St. Catharines, Ontario, Canada, Dec. 25, 1882. He came to the United States at the age of twelve years and was graduated from Missouri University with a degree of B.S. in electrical engineering in 1907. Immediately after graduation he became connected with the engineering department of the Wagner Electric Manufacturing Company, specializing largely in electrical design and industrial application of motors.

Morton McDonald, formerly of the sales engineering staff of the Cutler-Hammer Manufacturing Company, Boston, has been appointed Boston district manager of the George H. Wahn Company, electrical supply jobber, Boston.

J. Leo Scanlon, until recently sales manager of the Maloney Electric Company, St. Louis, has resigned that position to establish the J. Leo Scanlon Company, manufacturers' agent, Buffalo, N. Y. Mr. Scanlon was graduated from the College of Applied Science

J. L. SCANLON

at the State University of Iowa in 1914 and in 1919 received the degree of electrical engineer from the same institution. At the beginning of the war he joined the Air Service, Aëronautical Section, U. S. A., and served in the British Isles and in France. On his return from the army he became connected with the Moloney Electric Company as salesman, later being promoted to the sales managership.

Robert M. Gates has become associated with the Superheater Company, New York. Mr. Gates was formerly a partner of the Herron Gates Company, Cleveland, which handled power-plant equipment, and later was connected with the Lakewood Engineering Company.

F. F. Sengstock, formerly connected with the Chicago Board of Underwriters as electrical engineer and for the past two years with the Sprague Electric Works of the General Electric Company as conduit specialist at the Chicago district office, has resigned to take up the duties as northern Illinois representative of the Trico Fuse Manufacturing Company, Milwaukee.

Albert B. Cudebec has severed his connection with the Ohio Brass Company to join the staff of the Canadian Porcelain Company as foreign representative, with headquarters at the office of the Guaranty Trust Company, 1 Rue des Italiens, Paris. Mr. Cudebec was with the Electric Bond & Share Company before the war. During the war he served in France on power development work.

E. A. Tulis has been appointed manager of the fixture department of the George H. Wahn Company, Boston, which recently became distributer for the Crescent Brass Products Company, Cleveland.

H. L. Jones, formerly assistant superintendent, has been appointed superintendent of the switchboard and detail department at the East Pittsburgh works, Westinghouse Electric & Manufacturing Company.

A. J. Bastian, formerly assistant superintendent, has been appointed superintendent of the insulating department at the East Pittsburgh works, Westinghouse Electric & Manufacturing Company.

Ernest Bradley, field representative of the Pettingell-Andrews Company, Boston, in the New Hampshire district, has been appointed head of the department of radio apparatus which has been established at the headquarters of the company.

A. S. Duncan, formerly storekeeper at the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company, has been appointed general storekeeper of finished stocks. His new duties comprise the general supervision of the organization of warehouse personnel, the methods used in the warehouse, the keeping of records and the mobility and accounting control of all finished stocks.

S. L. Case, for fourteen years connected with the purchasing department of the Stone & Webster Company, has resigned to accept a position as sales engineer with the Westinghouse Electric & Manufacturing Company. He will have charge of the Pacific Coast division and will specialize on high-tension insulators for transmission work, for which his long experience along these lines peculiarly fits him.

W. C. Allen, formerly manager of the Black & Decker Manufacturing Company's Philadelphia branch and subsequently special representative, has been made branch manager of the company's Chicago territory, which includes Wisconsin, Illinois, Missouri, Iowa, Minnesota and North Dakota. Mr. Allen has been connected with the Manley Manufacturing Company as assistant sales manager and has been associated with the Black & Decker company for about three years.

Norman L. Snow has resigned his position as vice-president and active head of the Terry Steam Turbine Company, Hartford, Conn., to become president and treasurer of the Diamond Power Specialty Corporation, Detroit, a new company which has purchased the business and plant of the Diamond Power Specialty Company. Mr. Snow has been connected with the Terry company for the past thirteen years. He is a graduate of the Sheffield Scientific School and Massachusetts Institute of Technology. He has been in the power plant field for the past eighteen years.

Paul L. Battey, formerly vice-president of the Arnold Company, engineers, Chicago, and for many years chief engineer in charge of all industrial operations of the company, has opened an office at 123 West Madison Street, Chicago, and will practice as a consulting engineer, taking charge of the design, supervision and construction of complete industrial plants and power plants.

T. H. Hays, formerly of the Indianapolis office of the Westinghouse Elec-

T. H. HAYS

tric & Manufacturing Company, has been promoted to the position of manager of the Indianapolis office.

W. A. Garside has been appointed New England sales representative of the Simplex Electric Heating Company, with headquarters at Cambridge, Mass. Mr. Garside was formerly sales representative of the company in the territory from Washington, D. C., to Florida, with headquarters at Charlotte, N. C.

Obituary

Horace M. Williams, president of the Electrol Manufacturing Company, battery manufacturer, Providence, R. I., died at his residence in that city on April 5. Death was due to heart failure. Mr. Williams was born in Elizabeth, N. J., July 24, 1854. He went to Providence about 1900 and had since been engaged in various battery enterprises. In 1917 he organized the present Electrol Manufacturing Company.

George R. Prout, president of James Leffel & Company, waterwheel and turbine manufacturers, Springfield, Ohio, died recently at his home in that city at the age of fifty-three. Mr. Prout had been engaged in manufacturing in Springfield since 1902 and before accepting the presidency of the Leffel company in 1919 was connected successively with the Superior Drill Company and the American Seeding Machine Company.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Steel Revival Helps Market for Carbon Products

SALES of carbon products, such as furnace electrodes, illuminating carbons and carbon brushes, have improved considerably since Jan. 1 and are running much ahead of last year. Increasing steel production, according to the carbon manufacturers, is responsible for the greater demand for furnace electrodes, a large percentage of the total production being used in that industry. Within the past month production of steel has jumped to the point where the plants of the United States Steel Corporation are operating at almost 75 per cent of capacity, while independents are doing almost as well. It is felt that steel is just getting into its stride and that the coal strike will act as only a temporary hindrance.

The demand for illuminating carbons has not come back in the same proportion as has that for electrodes, and this can be traced to the motion-picture business. The depression in the amusement world is still noticeable, and though prospects are very good for a revival, it is not apt to come before fall. Carbon brushes are in somewhat better demand, and central stations are purchasing in satisfactory quantities. Industrials are still taking only subnormal quantities. The automotive industry is the bright spot in the carbon-brush market, and continued improvement is looked for.

March Construction Largest Reported in Two Years

THE month of March saw the largest volume of construction started in any month since April, 1920, according to figures gathered by the F. W. Dodge Company. The total amount of contracts awarded during March in the twenty-seven Northeastern states of the country amounted to $293,636,000, an increase of 65 per cent over February and of 79 per cent over March, 1921. The first quarter of this year was 68 per cent ahead of the first quarter of 1921.

Practically every class of construction showed a notable increase in March. The amount of residential construction was the largest since the summer months of 1919. March residential contracts amounted to $121,551,000, which was 40 per cent of the month's total. Public works and utilities amounted to $51,997 000, or 18 per cent of the total; business buildings, $49,758,000 (largest figure in this class since May, 1920), or 17 per cent of the month's total; educational buildings, $25,575,000, or 8 per cent, and industrial buildings, $24,270,000, or 8 per cent. The amount of contemplated new work reported in March was $613,000,000, more than double the amount of contracts awarded and the largest amount of contemplated work reported for any month since March, 1920.

The contracts awarded in New York State and northern New Jersey amounted to $88,506,000, only a quarter of a million dollars under the highest monthly total on record for this district. The total was 49 per cent ahead of February and triple the figure for March of last year. The volume of construction started since Jan. 1 has been two and one-half times as large as that started during the first quarter of 1921. New England contracts increased 78 per cent over February and 100 per cent over March, 1921, while in the Middle Atlantic States the increase amounted to 62 per cent over the previous month and 66 per cent over March, 1921. Contracts placed in the Pittsburgh district increased 52 per cent over February, but were 10 per cent under March, 1921. In the Central West contracts reached the highest total since April, 1920, the figure being 88 per cent ahead of February and 75 per cent ahead of the previous March. Construction started during March in the Northwest was double that of February and one-third greater than in March, 1921.

In connection with this widespread building activity it may be noted that wholesale prices of building materials continue to drop. According to the latest figures from the Division of Building and Housing, United States Department of Commerce, the February index figure for building materials is 158.7, against 159.9 in January and 160.8 in December, 1921. The peak in April, 1920, was 304.6. In the two years since April, 1920, structural steel has shown the greatest drop, the present index being 99.3 against a peak of 331.0. Copper wire, sheet copper, lead pipe and sheet zinc have just been added to the group making up the composite index.

Radio Popularity Has Caused Large Increase in Battery Demand

THE sudden popularity of the radio telephone has largely speeded up the demand for dry cells, according to a manufacturer, and thus has thrown business to an industry which a year ago little suspected to what an extent it would soon be benefited by a caprice of the public's favor. The market for dry cells remained remarkably good even through the dullest period of 1921, for the business is concerned with a product which must be replaced at frequent intervals. Sales did fall off last spring, but not in proportion to other commodities, and from then to the first of the year they continued on the increase. However, it remained for the radio demand to bring dry-cell business back to a normal basis.

Sales of batteries to the automotive field are reported to be increasing, with prospects brightening still further as new cars are announced and old plants put back into production. In addition, gasoline tractors and other agricultural apparatus are now being put back into use, and this calls for large numbers of batteries. Building of rural telephone lines, which use large numbers of dry cells, is going ahead rapidly, and the demand from this source will be heavy for several months. Railroad buying is continuing at a satisfactory rate.

Orders for Automatic Stokers Running Much Ahead of Last Year

SALES of automatic stokers to central-station companies and large industrial plants are running from 40 to 50 per cent ahead of sales at this time last year and have kept this pace up steadily since the first of the year. This is the outstanding fact in this industry, according to several manufacturers interviewed by the ELECTRICAL WORLD. As a result the manufacturers are very optimistic and not only have increased production considerably since the first of the year but are looking forward to running at full capacity before many months are gone.

This cheerfulness, it seems, is predicated on good grounds. Central stations form the most important class of buyers of this equipment, and it is accepted that they are in a

financial condition which will permit them to make extensions and improvements whenever they decide to do so. At this time last year central stations were making many inquiries but evidently were not in a mood to buy, and a large percentage of these prospective orders failed to materialize. This year an inquiry for automatic stoking equipment has generally meant an order. These orders are coming from practically all sections of the country.

Deliveries can be made immediately as a rule on standard equipment and in normal time on special apparatus. What effect the coal strike will have is uncertain as pig iron is the prime raw material used and a shortage of fuel would mean an almost immediate shortage of pig. This might have a temporary effect on prices also. Quotations now are down to about 15 per cent below the highest point reached in 1920. There seems to be little chance of their receding further, for iron and steel prices had started upward even before the coal strike was taken seriously.

Export demand is holding up well, with activity particularly noticeable in England, some of the British possessions and France. An official of an American company having a British subsidiary reports orders there double the present manufacturing capacity of the British plant.

Volume of Wiring-Device Trade Better

A GRADUAL improvement in the demand for wiring devices is reported by a number of representative manufacturers. Plants are running close to full time each week, although it has not been necessary to force production by enlarging the personnel to any material extent. The expansion of the building industry is a helpful factor in the situation, and some production of sockets and switches for stock is in progress. Wage liquidation has been under way to some extent in the factories. Raw material is plentiful and buying is well distributed from different parts of the country. Foreign trade is running to very low volumes at present, the exchange situation continuing a bar to expansion.

Jobbers are still buying largely from hand to mouth, but the development of the building industry is tending to create either more frequent orders or larger single orders. Acute competition exists in jobbing circles, notably in connection with the distribution of sockets, but here and there a vigorous effort is being made to sustain the going price and to raise the margin somewhat above the figures lately quoted to contractor-dealers by distributers. It is argued that the ultimate consumer pays the wiring concern an exceedingly liberal profit upon sockets, for example, and that the contractor-dealer has been getting his supply from the jobber at a price range below or barely meeting the over-all costs of the distributer. Hence, some jobbers feel, a somewhat stiffer price to the wiring house handling these supplies to the consumer is just fiable.

The small wiring specialties required in radio work are in great demand owing to the nation-wide appetite for this class of electrical equipment, but so far no complaints of poor delivery conditions have become generally current.

German Electric Flatirons on Sale Here Found Defective

A COMMUNICATION sent out by Thomas Henry Day, president of the Western New England Association of Electrical Inspectors, states that a recent test of electric flatirons made in Germany and sold in New York showed every sample to be more or less defective and considerably below the standard set by American manufacturers of these appliances. The open letter sent out by Mr. Day asserted that he was advised of the receipt of 15,000 dozen of these flatirons by a dealer in New York at a cost considerably less than $10 per dozen and that efforts have been made to interest the trade in other sections of the country, especially New England.

Four of these irons were purchased from dealers who did not usually handle electric appliances at a cost of $1 each, complete with attachment plug and four feet of flexible cord. The voltage to which the irons should be connected is not shown on the irons, but tests indicated a wattage of 950. None of the samples, said Mr. Day, continued in circuit long enough to permit the intended tests to be completed, the heating element breaking down in from three to thirty-five minutes. As there are no replacement parts available, such irons would prove expensive at any price. When taken apart the device proved to consist of a wooden attachment plug, a flexible cord considerably below standard and a heating element of sheet-mica matrix wound about with iron wire and very poorly insulated. No stands are provided, though this has been a requirement in this country for a number of years. These and various other defects, Mr. Day reports, make these irons not only worthless but dangerous.

Metal Market Situation

THE copper market the last week has shown a very sharp upturn, and the price of electrolytic has risen from 12⅝ cents per pound to 12¾ to 13 cents. At the beginning of last week the market had gone practically stagnant and some buyers were expecting still further drops from the 12⅝ cents price. In view of the later development it must be admitted that the depression was more psychological than otherwise and that the present buying movement is the logical result of natural economic causes.

In the first place the statistical situation of the market has been growing better each month since last September. In March this improvement continued at a hitherto unprecedented rate, revised estimates of sales into domestic and foreign consumption putting the total at 185,000,000 lb. as against 100,000,000 lb. in February and 65,000,000 lb. in January. Stocks held by the Copper Export Association have been reduced to less than 200,000,000 lb., and stocks of refined for the country are placed at about 450,000,000 lb. The production of refined during March was only 80,000,000 lb.. a much smaller total than that of sales. Deliveries into both foreign and domestic consumption during March are put at 150,000,000 lb. From these figures it will be seen that at the present rate of consumption and production there would be a copper shortage within six months, provided of course that producers failed to take the necessary steps to ward it off. Of course they will, but at all events the supply of copper will be well under their control. Demand, too, is increasing rapidly with new electrical developments daily, increased sales by brass makers, the return of copper to most of the uses from which it had been ousted by substitutes during the war, and the pushing of new uses by producers. With stocks low and demand increasing, there is little doubt that the market will be firm from now on with occasional quiet periods.

The steel industry, which was just getting into its stride, has received a setback in the shape of the coal strike. March output gained almost three quarters of a million tons and April orders promised to better that figure.

NEW YORK METAL MARKET PRICES

	April 4, 1922	April 11, 1921
Copper:		
London, standard spot	£ s. d. 57 2 6	£ s. d. 57 2 6
	Cents per Pound	Cents per Pound
Prime Lake	12.75	12.87½-13.00
Electrolytic	12.75	12.75
Casting	12.50	12.50
Wire base	13.87½-14.12½	14.00 -14.25
Lead Am S. & R. price	4.90	5.00
Antimony	4.50	4.87½
Nickel, ingot	31.00	36.00
Shee zinc, f.o.b. smelter	7.50	7.50
Zinc, spot	5.05	5.22½-5 27½
Tin, straits	29.37½	30.50
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	11.00 -11.37½	11.00 -11.25
Brass, heavy	5.00 - 5.37½	5.00 - 5.50
Brass, light	4.75 - 4.87½	4.75 - 4.87½
Lead, heavy	3.75 - 3.87½	4.00 - 4.12½
Zinc, c'd scrap	2.25 - 2.50	2.50 - 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

THE improvement in the electrical industry was sustained by last week's business, and April bids fair to be a successful month. One of the important developments of the week was the proposing of an ordinance in St. Louis to make the use of conduit and safety switches necessary in certain electrical construction. The passage of such a bill would create a heavy demand for those items in that city. St. Louis jobbers report sales generally good, with considerable interest manifested in industrial heating equipment. Business in Chicago is satisfactory, with especial activity noted in motors, one manufacturer reporting his March sales as the best in many months. Boston trade is spotty, but improving in wiring materials, small motors and lamps.

Electrical jobbing is still slow in Atlanta and the Southeast, mainly on account of the long-continued bad weather. Florida, however, with a good citrus crop sold, is enjoying more business than the rest of the section. On the Pacific Coast from Los Angeles up to Seattle range-selling campaigns are being planned or put under way, and a great deal of business is expected to develop during the summer.

NEW YORK

Business in the electrical trade is showing a decided improvement. Jobbers generally state that figures for their March sales show a very healthy increase over those for the previous month, and at least one jobber reported that March had been his best month in the last year and a half. April sales so far have held up well and indications point to a continued gradual improvement. There has been no spectacular development along any particular lines as the movement has been very evenly distributed.

Another good sign is the number of contracts which have been placed for wiring supplies to be used in commercial buildings and large apartment houses now under construction. Contractors seem to feel that present quotations on conduit, wire, armored cable, etc., are sufficiently attractive for them to buy for future requirements.

No important price changes were recorded this week. Several manufacturers of switches, receptacles, sockets and related items have issued new discount schedules. The changes, however, are slight and for the most part amount to a general revision of quotations.

Rigid Conduit.—Sales of this material are showing some improvement and several car-lot orders have been placed. Prices remain unchanged. Quotations this week were as follows: For ½-in. black pipe in 2,500-ft. lots, $44.50; ¾-in., $58.10, and 1-in., $82.79 per 1,000 ft. Galvanized pipe in the same sizes and quantities remains at $50, $64.50 and $92.20 per 1,000 ft.

Rubber-Covered Wire.—Demand for wire is a little better than formerly although no change in prices has been made. The increase in building activity of course accounts for this improvement. No. 14 rubber-covered is quoted at $6.35 per 1,000 ft. in 5,000-ft. lots. In lots of 10,000 ft. sales have been made at $6.25 per 1,000 ft.

Flexible Armored Conductor.—Armored cable continues in active demand and a number of sales in fair-sized quantities have been made. Quotations of No. 14, two-wire, single-strip, range from $43 to $45 per 1,000 ft. for that quantity. Double-strip sells for $45 to $47 per 1,000 ft. Jobbers' stocks are in fairly good shape.

Wiring Supplies.—Several manufacturers of so-called schedule material have issued new discount sheets calling for some slight reductions on certain items. The changes, however, are virtually only a revision of price lists.

Lamp Cord.—Sales are fair and jobbers' stocks are fair to large. No. 18, cotton, twisted, sells from $11.65 to $12.75 per 1,000 ft. Parallel is quoted at $14.50 to $15.45 per 1,000 ft.

Dry Cells.—A steady demand for standard cells is reported. In barrel lots igniters are quoted at $30 per 100.

Fans.—Buying for stock has been very good this year, and two exceptionally warm days early this week have acted as a remarkable stimulus to sales.

Appliances.—Heating devices continue to move at about their usual pace. A special combination offer by one manufacturer whereby a reduced price is made on toasters has materially increased sales on this article.

CHICAGO

Although the electrical business for the past week has equaled the average activity of the month, few important changes occurred. Price variations still exist, but the movement of wiring materials has been steady. A large order for outdoor substations was reported by one manufacturer of high-tension apparatus. The motor market has awakened from the winter sluggishness and nearly all manufacturers report that conditions are improving. Radio still continues to be the center of attraction of the electrical industry, but stocks are low on both head telephones and vacuum tubes.

Building permits for March numbered 1,327, with a valuation of $19,333,900 and a frontage of 45,684 ft. This is an increase of 693 over February's permits. The month of March had 686 permits for residences, 409 for apartment buildings, 176 for industrial structures and 56 for others. Twelve months of building at this rate would give Chicago 32,988 new homes costing $228,000,000. This compares favorably with the total valuation in 1910 of $123,000,000.

Flexible Armored Conductor.—Jobbers report a good movement, but prices vary from $41 to $42.50 per 1,000 ft. in 5,000-ft. lots. Stocks are fair but not large.

Wire.—The call for No. 14 rubber-covered wire has been steady, but the majority of sales have been for small amounts. In 5,000-ft. lots, this material sells for $6.25 per 1,000 ft. and stocks are in good condition. The demand for weatherproof wire has been fair and it is available for 16 cents a pound. Bare wire has been moving steadily, but the price is unchanged.

High-Tension Equipment.—Orders for a 33,000-volt and a 66,000-volt outdoor substation, each rated at 10,000 kva., were received during the week by one manufacturer. Manufacturers also report some good sales on 66,000-volt pole-top switches for the coast.

Motors.—An improved market for motors during the month of March was reported by a number of manufacturers. One company said that its March sales had not been duplicated within the last eight months. The demand for both large and small sizes has been equally distributed since the industrial companies are reported buying again. The call for motors up to 10 hp. has been steady.

Poles.—Dealers tell of a sustained market, and the only price changes have been on the small-sized poles. A reduction of about 15 per cent on the 16-ft. and 20-ft. Northern white-cedar pole went into effect March 23, but dealers report very little action on this material.

Wiring Material.—An increased call has been noted, and trade has been steadily improving. A reduction of about 5 per cent on the single-pole push-button switch has been reported. No price changes on the regular equipment have been noted and stocks are ample.

Radio.—The interest in this equipment is still sustained and appears to be increasing daily. All dealers report shortage of stocks, especially in head telephones and vacuum tubes. Orders are being placed for future deliveries without time guarantees.

BOSTON

Trade is rather spotty this week in New England, but the demand for wiring materials, small motors and lamps show some improvement. Prices are fairly steady, but competition is extremely acute and price cutting is frequent. Little buying for jobbers' stocks is apparent beyond thirty-day requirements. Conditions in the textile field continue bad owing to labor troubles, although some mills report increasing outputs as striking employees return to work in small numbers. No early settlement is expected in this field. Trade is fairly good in the paper industry, dull in the leather field and improving in the metal lines. Building is increasing by leaps and bounds, and this constitutes the brightest aspect of New England industry at the moment.

Building and engineering contracts for New England for the week ended April 4 totaled $9,279,100 against $1,995,500 for the same week last year. This is the best record for this week in twenty years. Contracts for March in these states amounted to $27,795,000, an increase of 78 per cent over February and over 100 per cent better than March, 1921. Forty-five per cent of the March, 1922, total was for residential work. Financial conditions continue favorable.

Ranges.—Orders for sample ranges for jobbers' and retailers' stocks are being placed with manufacturers and installations for new apartment-house service are picking up somewhat. Manufacturing for stock is proceeding steadily. Prices are firm and a good season is anticipated.

Heaters.—Trade is sluggish, but the demand for summer camp service will soon begin to be felt. Mild weather resulted in a rather poor season in portable heaters, although prices were well maintained.

Electric Refrigerators.—Sales are picking up decidedly and the outlook is for an excellent season. Development of smaller sizes of apparatus is attracting trade, and one dealer reported Monday having sold six machines within the past month, this total representing about a year's previous business.

Wire.—Prices are open on rubber-covered wire on 5,000-ft. lots and over. No. 14 sells around $7 per 1,000 ft. in 1,000-ft. lots. Weatherproof wire is moving quietly at 15½ cents base. Bare copper price is stiffer, Boston base being 15¼ cents Monday. Inquiries are active from central-station companies for both bare and weatherproof wire, and some trolley wire is being sold.

Motors.—A better demand is noted for sizes of 5 hp. and below, and fractional horsepower motors are moving a little better. Stocks are still too large to warrant much increase in manufacturing activity.

Rigid Conduit—The demand for small-order lots is improving. Prices are steady, the following being representative: Black, ½-in., $48.32 per 1,000 ft.; galvanized, $53.42; black, 1-in., $88.15; galvanized, $98.35, per 1,000 ft., all in 5,000-ft. lots.

Appliances.—Vacuum-cleaner sales are improving and a better tone is apparent in washers. Hollow ware is not moving very fast at present. Price conditions are being weighed carefully before purchases are made, but the public is being converted to the service idea better than formerly.

ATLANTA

The outlook for business in general continues to brighten, and there is an undertone of increased activity apparent in nearly all lines. Electrical jobbers, however, report that as yet this improvement is not making itself felt in their line, which continues very slow. This is due to the fact that building is still delayed, while the buying public is not investing in electric appliances as freely as has been the case heretofore. Business in the smaller towns is very dull, owing to the fact that planting operations are already two to five weeks behind, which has served to handicap truck farmers in all parts of the state. As the farmer was anxious to be ready for early planting of cotton in order to avoid the damage of the boll weevil, the delay is causing a little pessimism regarding the outlook for the ready-money crop next fall. Florida continues in good shape, the movement of the citrus crop this year having been quite satisfactory. The sale of this was stimulated by the freezing temperature in California which damaged the orange crop in that section. The slight trend upward of farm prices in January is lending a little more strength to the business outlook in the rural districts.

Building permits are being granted in considerable volume, 471 having been issued in Atlanta during the month of March with a valuation of $2,110,818, while reports from the section for February show a total number of 2,035 permits in twenty-three cities with a valuation of $10,565,955. The increase in the section's building activities is approximately 100 per cent over that of the same month last year.

Industrial Motors.—Sales have been somewhat spotty for the past ten days, but there are a number of inquiries on hand, with the prospect that sales will show a sharp improvement in the near future. Local stocks and shipments are reported in good shape with prices steady.

Oil Switches.—Like industrial motors, the demand in this line is weak. Jobbers' stocks have been allowed to run very low, though manufacturers have reasonably good stocks on hand.

Rigid Conduit.—The delay in building operations caused by inclement weather is making itself felt in the movement of conduit, which has slowed down considerably in the past thirty days. There is still a fair movement in the more popular sizes, but it is not up to expectations. Ample stocks in all sizes are reported on hand.

Vacuum Cleaners.—This line should be active at this time, but only a very small volume of sales is reported. One of the largest manufacturers, however, is preparing to start a brisk campaign on May 1 and expects to get good results. Local stocks are in good condition.

Interphones.—Sales are reported only fair, while signal and call systems are very slow. Some pick-up is expected as school and hospital construction now proposed gets under way. Stocks of interphones are good, while the shipments on signal and call systems are quite satisfactory.

Insulators.—The glass type is in fair demand, independent telephone companies taking a fair quantity. The porcelain type is somewhat slow, though slightly improved over recent months.

Farm-Light Outfits.—Campaigns by manufacturers have resulted in a fairly satisfactory turnover, deferred payments having been of material assistance in accomplishing this result. Local stocks are in good shape with shipments satisfactory.

ST. LOUIS

The carpenters' strike is probably impeding the progress of large construction jobs in St. Louis, but residential structures are being built in increasing numbers. Permits issued for the latter class of work are about 50 per cent greater than they were a year ago. The total value of permits issued in March by the city of St. Louis amounted to $1,799,005, as compared with $974,405 for the same month last year. Industrial construction still lags, as is indicated by the $46,300 in permits for workshops and factories issued in March. The nature of wiring work in St. Louis will be materially altered if a proposed ordinance now before the Board of Aldermen is passed. This provides, in part, that all wiring shall be in conduit and that all entrance switches shall be of the inclosed "safety" type.

Sales for the week were up to the recent average. Inquiries continue to come in much greater volume than orders. The industrial situation in this territory is unquestionably improving, and improved electrical sales are bound to come soon. As an indication of the better buying spirit on the part of the public, a large manufacturer of a comparatively low-priced automobile reports production as great as at any time in 1920, while the April production schedule calls for a 60 per cent increase.

Wiring Material.—A number of price reductions have been announced. Non-indicating porcelain 5-amp. snap switches have been reduced from $21 to $15.40 per 100, in lots of 250, single-pole push-button switches from $19.25 to

$16.70 per 100 in lots of 100, three-way push-button switches from $27.50 to $23.10 per 100 in lots of 100, and single-push switch plates from $7.70 to $6.60 per 100 in lots of 100. Sales are spotty and as a rule for small amounts. The total volume is showing slight improvement, and stocks are conservatively maintained.

Conduit.—A proposed ordinance that seems likely to be passed provides that all wiring in St. Louis shall be in conduit. Stocks and deliveries are in good condition to meet the increased demand that would thereby result. At the present time sales are comparatively quiet. Following are representative prices: ½-in. black, $4.35 per 100 ft.; ½-in. galvanized, $4.95 per 100 ft.; ¾-in. black, $5.50 per 100 ft.; ¾-in. galvanized, $6.30 per 100 ft., in 1,000-ft. lots.

Entrance Switches. — Externally operated entrance switches will be required for all installations in St. Louis if the new wiring ordinance is passed. Stocks now on hand are ample for present requirements, but considerable additional buying will be required to meet the demand should the new rule become effective. One well-known type of switch now sells for $1.30 each in lots of twenty-five or more.

Industrial Heating Equipment.—Increased interest is being manifested in the installation of electric heating equipment, principally for vitreous enamel work, core baking and japan and paint drying. Some comparatively large orders are expected to be closed in the next thirty to sixty days. At a recent meeting of the American Ceramic Society the electric furnace was actively discussed and an installation here was examined and was very favorably reported on.

PORTLAND—SEATTLE

General business conditions apparently are starting once more to improve after a period of quietness. Lumber production for the Northwest for the week ended April 1 was only 10 per cent below normal. Nevertheless, new business for the week exceeded production by 17 per cent and shipments were only 4 per cent below new business, indicating that the lumber industry is picking up very rapidly and that production must increase materially if it is to keep ahead of the demand. Building throughout the Northwest for the month of March was very active, and in the case of Portland the value of permits taken out was the greatest for any month in the history of the city. The employment situation in Seattle is reported as improving slowly, there having been a reduction of 13 per cent in the number of unemployed in the month of March.

From reports of electrical jobbers and dealers it may be concluded that the electrical business is quite generally satisfactory. An extensive advertising and educational campaign undertaken by one of the large Pacific Coast jobbers is producing quite satisfactory results in the way of increased business. Credits are somewhat improved as are also collections. Prices on the whole seem to have reached a pretty stable basis and no important changes have been noted during the past week or two. Inquiries are improving, particularly in regard to high-tension line material. Schedule material is quite active and the demand for electric ranges is good in some sections. The Portland central stations report that approximately fifty electric ranges are being installed each month in the city. Electrical permits taken out in the city of Portland for the month of March were 38 per cent greater than for March, 1921, and exceeded the number for any March in the history of the department.

Wire.—The demand for rubber-covered wire is steady, being sustained by activity in apartment and residence construction. No. 14 is quoted at $6.70 per 1,000 ft. in 5,000-ft. lots and No. 12 is $9.10 in similar quantities. The base price on bare wire is $17.50 per 100 lb. No. 6 weatherproof is quoted at from $19.50 to $21 per 100 lb. in lots of 500 lb.

Sockets.—The movement in sockets is very satisfactory. Prices have remained firm for some weeks. Keyless brass sockets are quoted at from $20.25 to $22.50 per 100, key sockets at from $21.30 to $24.55 per 100, and pull-chain sockets at from $40.50 to $45 per 100, all prices in carton lots.

SAN FRANCISCO

The value of building permits issued in the four principal California cities during March, 1922, was as follows: Los Angeles, $10,964,829; San Francisco, $3,289,251; Oakland, $1,925,577; San Diego, $1,068,700. The value for March, 1921, was: Los Angeles, $6,915,216; San Francisco, $2,941,402; Oakland, $1,314,457; San Diego, $1,241,532. All signs point to even greater increases in building, for more homes are badly needed. Los Angeles has several large hotels contemplated, and San Francisco needs a great deal of school and other municipal construction. However, there has been a certain unrest among some of the building trades unions in San Francisco, the bricklayers being actually out on strike and some of the other crafts considering such action. Electrical contractors generally believe that there will not be a general building strike such as that of last year as both sides have too recent memories of its effects.

Ranges.—Though nothing definite has yet been broached, it is known that committees from all branches of the industry are working out a practicable campaign that will probably be based on sales at list price and on intelligent co-operation between dealers and central stations.

Water Heaters.—A remarkable increase in installations was shown during 1921, running close to 70 per cent, or more than triple the general increase in range installations. The outside circulation type in the 5-kw. size with thermostatic control is now practically standardized. This line too will be covered by the campaign.

Fans.—Nearly all contracts for the present season have been signed, although the ordering in general has been a little lighter than last year. However, experts predict that the unusually cold winter will be followed by a very hot summer, and so it may be that even last year's remarkable fan showing will be surpassed.

Dishwashers.—Sales of dishwashers are steadily increasing, although they fall far short of what they should be or of what they will be under the stimulus of the publicity and attention now being given this device. The number of firms regularly carrying a dishwasher of some type has almost doubled during the past year.

Motors.—The past week has been rather quiet in motor sales. Smaller motors, however, are the subject of considerable inquiry. There have been many calls for electric drills and other tools. The second-hand motor business is very slow, and nearly all shops have been compelled to reduce their organizations. Some of them, however, report many inquiries for pumping plants.

SALT LAKE CITY—DENVER

Interest in radio is growing rapidly in this region, several of the large jobbing houses having already obtained distribution rights and placed orders for equipment. Advertising campaigns tying in with the wide national publicity now in progress are being conducted through the newspapers. That a large demand for radiophone installations will be created seems certain. Shipments to this territory are expected in the very near future and technicians of experience will be employd to supervise the installations.

Latest official reports show that the employment situation is improving slowly but steadily. The coal mines have passed through the big production season of the year and will employ fewer miners for the next few months, but the steel, iron and copper mines are steadily increasing their forces. Skilled and unskilled labor for construction is plentiful. The season is now far enough advanced for cottage building to get under way and ground is being broken for hundreds of new homes. In the larger cities central-station companies are actively on the job of spreading the appliance-outlet propaganda, with the object of increasing the market for power. The emphasis in advertising has now shifted from washing machines to vacuum cleaners, and small payments down and easy terms are counted on to stimulate selling. Many households are availing themselves of the opportunity to such an extent that trade is showing a considerable improvement in these lines.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Wakefield Brass Reports Good Business

The F. W. Wakefield Brass Company of Vermilion, Ohio, reports a steady increase of business during the first three months of 1922. Officials of the company state that April started off with an order for 1,800 "Red Spot" hangers for a new office at Dallas, Tex., and that numerous other orders and inquiries are coming in.

Universal Electric Sign Company a New Chicago Manufacturer

The Universal Electric Sign Company, 4854 West Kinzie Street, Chicago, a new corporation with capital stock of $12,000, has leased the plant at that address to manufacture electric signs. The company has purchased the necessary metal-working machinery for this 60-ft. x 90-ft. factory, and according to G. H. Thompson, Jr., secretary and treasurer, is receiving a satisfactory volume of electric sign business. The officers are: R. I. O'Connor, president; S. M. Moses, vice-president, and G. H. Thompson, Jr., secretary and treasurer.

Sorgel Electric Company Takes More Manufacturing Space

The Sorgel Electric Company, 138-140 West Water Street, Milwaukee, electrical jobber and repairer, has acquired two additional floors in the building at 140 West Water Street. This move was made necessary, according to W. R. Sorgel, secretary and treasurer, by recent increases in business and the addition of new lines. A radio department has been added, and the company will do both a jobbing and retailing business in this specialty.

Increasing Business Makes Westinghouse Changes Necessary

Increasing activity in the power and railway divisions of the Pittsburgh office of the Westinghouse Electric & Manufacturing Company has resulted in the separation of the two divisions and some new appointments in personnel of management. Barton Steveson, who has been manager of both divisions, will continue as manager of the power division and will devote his entire time to activities in connection with that unit. F. G. Hickling has been appointed manager of the railway division, the appointment becoming effective immediately. S. R. Shave has been appointed manager of the price section of both the power and railway divisions in the Pittsburgh office. The separation of the two divisions under different heads will facilitate the handling of both power and railway business, according to the company's announcement.

Fire Damages Canada Plant of Packard Electric

A fire at the plant of the Packard Electric Company at St. Catharines, Ontario, Canada, recently caused a loss estimated at about $20,000. A number of large transformers just completed on order had been stored in the basement of the plant; the basement was flooded during the fire, and the total damage cannot be estimated until the transformers are dried out and tested to discover whether they have been harmed.

International General Electric's 1921 Business 17 per Cent Ahead of 1920

In the year 1921, according to the annual report of the International General Electric Company, the company billed sales to the amount of $38,359,000, as against $32,775,000 in 1920, a gain of 17 per cent. The total income of the company during the year was $40,940,661, while net income amounted to $3,226,116. However, of this, there was available only $1,973,072 for dividends on the preferred and common stock, compared with $2,406,957 in 1920. The merchandise on hand, it is stated, has been written down either to cost or market value as of Dec. 31, 1921, depending on which value was lower, and additional depreciation and reserves have been made for excess and slow-moving stock.

In his remarks to stockholders in regard to the outlook, Gerard Swope, president, says:

"Unfilled orders on the books of your company on Jan. 1, 1922, were upward of $12,700,000. The outlook for export business for the current year is not promising, and shipments are expected to be much less than in the year just closed. Despite this, owing to large curtailment in expenses, it is believed that the operations of your company will show a reasonable profit for the year 1922. There is increasing need throughout the world for the construction of hydro-electric and other enterprises, which will require large amounts of electrical apparatus. The investment of adequate capital for the support of such enterprises may be expected to follow an improvement in the economic and financial situation abroad."

Radio Manufacturer Takes Over Machine-Tool Plant

The plant of the Greaves-Klusman Machine Tool Company, Cook and Alfred Streets, Cincinnati, has been bought by the Crossley Manufacturing Company, radio equipment manufacturers of that city. The plant is to be equipped for the manufacture of radio apparatus. The factory will give the Crossley company approximately 25,000 sq.ft. of floor space and is expected to give employment to more than 400 persons when running full capacity. The actual operation of the plant will be undertaken by a subsidiary of the Crossley company, the American Automobile Accessories Company. Powell Crossley, Jr., is president.

Sewickley Company Formed to Manufacture Meters

The formation of the Sewickley Electric Manufacturing Company, Sewickley, Pa., has been announced with the further information that the principal product is to be watt-hour meters. The meter will be marketed under the trade name "Semco." The initial capitalization of the company is given as $500,000.

The company already has secured its factory, which is a reinforced-concrete structure having approximately 40,000 sq.ft. of floor space. The plant is located at Stoops Ferry, Pa., about 12 miles west of Pittsburgh on the New York Central Railroad, giving very good shipping facilities. The offices of the company are at Sewickley. The officers of the company are: Tracy M. Kramer, president; Gilbert Hunter, vice-president; Frank Semple, Jr., secretary and treasurer.

Landers, Frary & Clark Postpone Addition to Plant

The proposed addition to the New Britain (Conn.) plant of Landers, Frary & Clark, manufacturers of various electrical appliances, will be postponed for the present, it is stated. All bids for the construction of the building have been rejected, and when the matter will be taken up again has not been announced. The addition was to have been six stories in height and would have considerably increased the company's manufacturing facilities.

Manufacturers' Agents Announce Merger

The DeVeau-Bartling Company is the name of a newly formed manufacturers' agency at 602 Equity Building, Detroit. Both members of the firm had been established previously as manufacturers' agents in the Detroit territory but had operated separately. Since combining they represent the Stanley & Patterson Company, Lowell Insulated Wire Company, Chase-Shawmut Company, Federal Porcelain Company, Passaic Rubber Company, General Apparatus Company and Horne Manufacturing Company.

Canadian General Electric Seeks More Working Capital

The Canadian General Electric Company has issued $5,000,000 worth of 6 per cent gold debentures, with the announced purpose of reimbursing the company for capital expenditures and providing additional working capital. The Canadian General Electric Company, which owns Canadian Allis-Chalmers, Ltd., is the largest manufacturer and distributer in Canada of electrical apparatus. The company has the right in perpetuity to manufacture and sell in Canada products of the General Electric Company and manufactures a varied line of machinery under a contract with the Allis-Chalmers Manufacturing Company, Milwaukee. The company and its subsidiary own eight manufacturing plants in Canada and maintain eighteen branch houses in principal distributing centers of the Dominion.

In its report for 1921, just issued, the company reports a deficit after dividends of $220,946, compared with a surplus of $342,575 in the previous year. The report shows total assets and liabilities of $34,614,834.

New Quarters for National Stamping Works

The National Stamping & Electrical Works, 424 South Clinton Street, Chicago, having completed the construction of a new one-story building costing $60,000 at 3238-50 West Lake Street, will leave their old quarters to occupy this new plant on about April 10. This new plant, which is 130 ft. x 150 ft., will allow all their manufacturing work to be done under one roof.

New Plant for Newgard & Company

Plans have practically been completed for a new manufacturing plant for Henry Newgard & Company, 947-55 West Washington Boulevard, Chicago. The company manufactures electrical specialties and also operates an electrical contracting business. The plant is to be one story in height, with 21,000 sq.ft. of floor space, and is to be built at 4603-19 Fullerton Avenue, Chicago. The plant with its equipment is to cost about $75,000.

Louisville Company Acquires More Factory Space

The William C. Knauth Electric Company, 113-115 West Market Street, Louisville, Ky., has purchased property adjoining its factory on First Street between Market and Main Streets. The building will be remodeled and will be completely equipped for the manufacture of repair parts for all kinds of motors and electrical power apparatus. The new property will increase the available floor space to 50,000 sq.ft. The move was made, according to officials of the company, to take care of largely increased business. Some of the additional space will be used for display purposes, but the main purpose of the move was to obtain greater facilities for the making of repairs to electric power apparatus.

Company Formed to Manufacture Oil-Burning Equipment

The formation of a company to manufacture fuel-oil-burning equipment under the name of the Combustion Company has been announced. The company will have its headquarters in Chicago and has leased a plant at 4256 North Western Avenue in that city, and production is expected to start in the near future. William T. Dean is president and J. F. Kennedy is secretary and treasurer.

Remy Electric Employs 1,165 Persons

The force of the Remy Electric Company, Anderson, Ind., which has been gradually growing for several weeks, reached 1,165 persons recently. The Remy business continues to improve steadily, and during the past week some of the former workers were taken back. The increase in business is steady, but no unusual pick-up is anticipated.

Business of Gray & Davis Improving

Better times in the market for electrical accessories for automobile service are indicated at the Gray & Davis factory at Cambridge, Mass., affiliated with the American Bosch Magneto Corporation. For the first quarter of 1922 shipments totaled $836,000, against $359,335 for the same period a year ago. As total shipments in 1921, including the now discontinued lamp department, were but $1,688,905, this branch of the organization has reached in three months nearly half of last year's total output. It is expected that 23,000 starting and lighting systems will be shipped during April and 26,000 in May. Releases from various companies have either been declared or will become effective May 1, in addition to present orders for prompt shipment.

Lynn Works of General Electric Now in Two Sections

Announcement has been made of the division of the Lynn (Mass.) Works of the General Electric Company into two sections, to be known as the West Lynn Works and the River Works. F. P. Cox has been appointed manager of the West Lynn plant and Nelson J. Darling manager of the River Works, both succeeding Richard H. Rice, deceased, who formerly exercised control over the entire plant. Mr. Darling was formerly assistant manager of the Erie (Pa.) Works of the General Electric Company, and Mr. Cox had for several years been closely associated with Mr. Rice at West Lynn. Under the jurisdiction of the River Works will come the branch factories located at Everett, Taunton, Hudson, Gloucester, and North Easton, Mass., and Windsor, Conn.

More Space for Radio Manufacturer

Because of the increased interest in radio telephony and the demand for apparatus, the Freed-Eisemann Radio Corporation has found it necessary to double the floor space formerly occupied by its factory. The company will take an additional floor at 255 Fourth Avenue, New York.

The Combustion Engineering Corporation, 43 Broad Street, New York, has opened a new branch office at 1137 Guardian Building, Cleveland. It will be in charge of Frank Henderson, who has been associated with several large stoker manufacturers in that territory for a number of years.

Sandvik Steel, Inc., has announced the consolidation of its general steel and steel-belt conveyor departments, with headquarters at 2001 Woolworth Building, New York. W. D. Thomas, formerly manager of New York export sales for the American Rolling Mill Company, is president and general manager.

The Reynolds Electric Company, 2650 West Congress Street, Chicago, manufacturer of electric motors, has moved its New York office from 1123 Broadway to 120 West Thirty-second Street. The office is in charge of C. W. Ellis.

The Electric Furnace Company has moved its general and sales offices from Alliance, Ohio, to Salem, Ohio. By this action all departments of the company will be consolidated at its works, Wilson Street and Pennsylvania Railroad, Salem.

The McClave-Brooks Company, 210 West Washington Square, Philadelphia, has appointed the Mahler Machinery & Supply Company, Syndicate Trust Building, St. Louis, as sales representative in that district for McClave combustion systems.

The Appleton Electric Company, 1701 Wellington Avenue, Chicago, manufacturer of conduit fittings, lighting and other electrical specialties, has appointed R. P. Tillotson, who has been associated with the company for the past thirteen years as Western sales manager and director, to take charge of the California territory, in which it was formerly represented by the Keeler, White Company, San Francisco. A branch office and warehouse will be maintained in Los Angeles. In addition to a branch office and warehouse in New York City, the Appleton Electric Company also has resident representatives in Atlanta, Boston, Cleveland, Detroit, Oklahoma City, Philadelphia, Pittsburgh, Portland, Ore., and St. Louis.

Philip E. Edelman, consulting electrical engineer, and the staff associated with him have moved their headquarters to 9 Church Street, New York City.

Foreign Trade Notes

THE ALLGEMEINE ELEKTRICITATS-GESELLSCHAFT of Germany, *Engineering* states, has decided to increase its capital stock by 250,000,000 marks, making the total capital 1,100,000,000 marks. Statements were made at the general meeting to the effect that, in spite of the eminently satisfactory year, the dividend was only increased by 2 per cent, although the bank balances had risen from 26,000,000 marks to 658,000,000 marks; also that the reserves had increased 300 per cent, now amounting to 288,000,000 marks, while the percentage of profits had been doubled and the sums set aside for welfare institutions nearly so. It was also argued that the "still reserves" of the company, the raw materials, half-finished and finished goods were booked at about one-quarter of their actual value. The holdings in other concerns represented a further reserve of some 435,000,000 marks above their book figures. It was pointed out by the board of directors that this was in perfect harmony with the policy of the company, also that machines, tools, models, etc., had been written down to 1 mark and that buildings and land figured at reduced sums. The "still reserves" proceeded from exchange transactions which had been undertaken to strengthen the position of the company and obtain an increased number of customers. The business policy of the board was to prepare for the future. The increase in capital was said to be necessary so as to enable the company to make fresh favorable exchange or interchange transactions.

New Apparatus and Publications

MOTORS AND GENERATORS. — The Ideal Electric & Manufacturing Company, Mansfield, Ohio, is distributing bulletin 102, covering its "Ideal" direct-current motors and generators. Bulletin 103 issued by the company describes the "Ideal" squirrel-cage and slip-ring induction motors.

LAMP STANDARDS.—The Electric Railway Equipment Company, Cincinnati, is distributing a circular describing and illustrating its ornamental lamp brackets and "Safety First" lamp standards with General Electric "Novalux" lighting units.

RADIO HEADSET. — The Manhattan Electrical Supply Company, 17 Park Place, New York City, has recently placed on the market the new "Manhattan" radio headset No. 2500.

FUSES.—"Simplicity Fuses" is the title of a folder issued by the Cote Brothers Manufacturing Corporation, 1425 First National Bank Building, Chicago, describing the "Simplicity" refillable fuse recently brought out by the company.

ELECTRICAL PORCELAIN.—The Findlay Electric Porcelain Company, Findlay, Ohio, is distributing a twenty-two page catalog describing its "Standard" electrical porcelain products.

EXHAUST FANS.—"A New Era in Exhaust Ventilation" is the title of the folder just issued by the Centrifugal Fan Company, 9-15 Seventeenth Avenue, Newark, N. J.

CONTROL INDICATORS. — Bulletin 43-A, issued by Payne Dean Limited, 103 Park Avenue, New York City, covers various "Dean products," including the new system for maintaining constant water level.

SAFETY SWITCHBOARDS.—Brown & Pengilly, 607 East Fourth Street, Los Angeles, are expanding their line of dead-front switchboard equipment and adding to it complete all-metal boards suitable for industrial plants.

METER AND SWITCH PANEL.—Brown & Pengilly, 607 East Fourth Street, Los Angeles, electrical manufacturers, have placed on the market a standardized meter and switch panel for special application to pumping and irrigation plants.

ANCHOR.—The Everstick Anchor Company, St. Louis, is putting a new anchor on the market under the name of "Expand-Screw."

GATE VALVES.—The Lunkenheimer Company, Cincinnati, has recently placed on the market the "Lunkenheimer" motor-operated gate valves, equipped with "Dean" control. These valves can be obtained in sizes of 6 in. and larger.

WIRE.—The American Copper Products Corporation, 200 Broadway, New York, is distributing a series of leaflets reprinted from its magazine advertising of the past year and describing its wire products.

SOCKET.—The Tri Novelty Company, Wilson, Pa., has recently placed on the market the new "Neidig" drop socket.

BATTERY AND BULB TESTER.—A battery and bulb tester, known as the "Handy" tester, has recently been developed by Weinberg & Company, 870 Blue Island Avenue, Chicago.

New Companies

THE CHICAGO SUBURBAN POWER & LIGHT COMPANY, Aurora, Ill., has been incorporated by Benjamin F. Alschuler, Ralph C. Putnam and Glenn T. Johnston. The company proposes to supply electricity for lamps, heaters and motors.

THE DUNCAN ELECTRIC COOKER COMPANY, 20 East Jackson Boulevard, Chicago, Ill., has been incorporated by Charles C. Bartlett, First National Bank Building; Wayne A. Duncan and Edward C. Lindsey. The company is capitalized at $125,000 and proposes to manufacture and deal in mechanical electrical devices and equipment.

LAVONIA, GA.—The Shoal Creek Power & Utility Company has been organized with a capital of $200,000, to install a distributing system in Lavonia. W. B. Richardson and T. R. Knox are among the incorporators.

THE MARSHALL ELECTRIC COMPANY, 10 South LaSalle Street, Chicago, has been incorporated for $10,000 to manufacture electrical machinery, including a constant-potential motor-generator battery-charging set. The incorporators are Otto B. Schram, Claude F. Smith and Thomas Marshall.

Record of Electrical Patents

Notes on United States Patents

(Issued March 21, 1922)

1,410,421. ELECTRIC WELDING; Louis J. Steele, Portsmouth, England. App. filed June 21, 1920. Machine for welding studs of iron, steel or brass onto metal bodies.

1,410,428. IGNITION DEVICE FOR INTERNAL-COMBUSTION ENGINES; Harry R. Van Deventer, Newark, N. J. App. filed April 7, 1919. Spark plugs placed on incline.

1,410,440. MEANS FOR PROTECTING THIRD-RAILS; Wincenty Woroniecki, Dickson, Pa. App. filed Dec. 12, 1921. Angular shield over rail automatically operated by train.

1,410,443. LOCK FOR EXPLOSION ENGINES; Robert C. Anderton, San Francisco, Cal. App. filed April 20, 1920. Combined with ignition system.

1,410,482. CABLE FASTENING; Julius J. Langer, New York, N. Y. App. filed Nov. 23, 1920. Terminal block for armored cable and flexible conduit.

1,410,499. METAL AND ITS MANUFACTURE; Aladar Pacz, Cleveland, Ohio. App. filed Feb. 20, 1917. Production of tungsten for lamps.

1,410,538. RELAY SYSTEM; Golder P. Wilson, Wilkinsburg, Pa. App. filed Jan. 20, 1921. Prevents stopping of rolling-mill motors until operation is completed.

(Issued March 28, 1922)

15,317 (reissue). ELECTRIC LANTERN; Charles W. Conger, Portland, Ore. App. filed Sept. 1, 1920. All rays reflected downward.

15,323 (reissue). CONTROLLING MEANS FOR ELECTRIC MOTORS; Frank G. Washburton, Manchester, England. App. filed Jan. 18, 1922. For several motors geared to same shaft.

1,410,545. INTERCOMMUNICATING SYSTEM; Leon D. Barrows, New York, N. Y. App. filed July 26, 1917. Single-line telephone system for widely separated stations.

1,410,550. PROCESS FOR THE RECOVERY OF THE PHOSPHOROUS CONTENT OF PHOSPHATIC MATERIAL; John N. Carothers, Anniston, Ala. App. filed March 11, 1920. Employs electric furnace.

1,410,566. ELECTRIC FURNACE; William D. Hadaway, Jr., New Rochelle, N. Y. App. filed June 17, 1920. Combined gas and electric furnace.

1,410,595. SEPARATOR FOR STORAGE BATTERIES; Charles Pottratz, Philadelphia, Pa. App. filed Dec. 18, 1920. Two sheets separated by ribs.

1,410,606. ELECTRIC VACUUM APPARATUS; Moritz Schenkel, Charlottenburg, Germany. App. filed Dec. 4, 1920. Means for sealing terminals.

1,410,651. ELECTRIC CONDUCTOR CONNECTOR; Arthur W. Caps, Topeka, Kan. App. filed June 7, 1920. Plug and socket connection.

1,410,654. REFRACTORY COVER FOR ELECTRIC FURNACES; Monroe S. Clawson, Upper Montclair, N. J. App. filed Dec. 1, 1920. Sectional cover to inclose crucible.

1,410,665. PROCESS OF EXHAUSTING AND SEALING ELECTRICAL GLOWLAMPS AND THE LIKE; Karl Finckh, Berlin-Tempelhof, Germany. App. filed June 24, 1921.

1,410,671. RAILROAD LANTERN; Paul Genesy, Ogden, Utah. App. filed March 30, 1921. Operates from dry cell.

1,410,700. SECTIONAL INSULATOR; Samuel S. Matthes, Mansfield, Ohio. App. filed Dec. 8, 1921. For trolley wires used in mines.

1,410,702. CONTROLLING AND REGULATING APPARATUS AND SYSTEM; Friedrich W. Meyer, Milwaukee, Wis. App. filed March 8, 1920. Regulation of electric machine by electronic valve.

1,410,756. VACUUM TUBE; Gilles Holst and Ekko Oosterhus, Eindhoven, Netherlands. App. filed March 30, 1921. Device for renewing gas in tube.

1,410,766. TELEPHONE-EXCHANGE SYSTEM; Alben E. Lundell, Chicago, Ill. App. filed Oct. 16, 1919. Means for increasing speed of selector switch operation.

1,410,793. CRYSTAL DETECTOR FOR WIRELESS TELEGRAPHY; Antoine Bonnefont, Paris, France. App. filed Nov. 9, 1920. Inclosing of crystal to prevent deterioration.

1,410,890. METHOD OF AND MEANS FOR MODULATING CARRIER OSCILLATIONS; John R. Carson, New York, N. Y. App. filed Aug. 8, 1918. Arrangement employing vacuum tubes.

1,410,912. TRANSMITTER FOR DISTANT CONTROLLING APPARATUS FOR ORDNANCE; Riccardo Girardelli, Rome, Italy. App. filed Jan. 16, 1914. Allows for distance between transmitter and gun.

1,410,914. COMMUTATOR FOR ELECTRIC MOTORS; Forest H. Hartzell, Dayton, Ohio. App. filed Oct. 23, 1917. For toy or small motors of low efficiency.

1,410,960. PANTAGRAPH TROLLEY; William Schaake, Pittsburgh, Pa. App. filed Oct. 16, 1918. Locking device to prevent accident release.

1,410,974. SECTION SWITCH; Nils J. A. Wahlberg, Pittsburgh, Pa. App. filed Jan. 5, 1918. For mounting on mine roofs.

1,410,975. CURRENT REGULATOR FOR AUTOMOBILE HEADLIGHT CIRCUITS; Harry E. Wallace, Chicago, Ill. App. filed Dec. 10, 1919. Automatic control for lamps supplied by magneto.

1,410,985. ELECTRIC LIGHTING FIXTURE; Richard M. Beard, New York, N. Y. App. filed Oct. 15, 1917. Reflector made of plaster composition directly on ceiling.

1,411,002. ELECTRIC LIGHT SOCKET; Marvin H. Davis, Douglas, Ark. App. filed Dec. 3, 1919. Switch operated by lamp base sliding up and down.

1,411,023. REGENERATIVE CONTROL FOR SINGLE-PHASE MOTORS; Rudolf E. Hellmund, Swissvale, Pa. App. filed Sept. 13, 1919. Power factor controlled by relay apparatus.

1,411,040. CONTROL SYSTEM; Edwin S. Lammers, Jr., Wilkinsburg, Pa. App. filed March 8, 1919. Controlling of direction and speed of motors.

1,411,041. CONTROL SYSTEM; Edwin S. Lammers, Jr., Wilkinsburg, Pa. App. filed March 8, 1919. Relay operation on circuits employing motors and generators.

1,411,042. CONTROL SYSTEM; Edwin S. Lamers, Jr., Wilkinsburg, Pa. App. filed March 8, 1919. Motor and generator inclosed circuit both use same controlling resistors.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

KEENE, N. H.—Plans are being prepared for the erection of a power house at the Elliott Community Hospital. Kendall, Taylor & Company, 93 Federal Street, Boston, Mass., are architects.

BOSTON, MASS.—The Edison Electric Illuminating Company has filed plans for the construction of a new power plant on Summer Street, comprising two units, to cost $200,000 and $75,000 respectively.

BOSTON, MASS.—The City Council has applied to the Legislature for an appropriation of $2,000,000 for an electrically operated pumping plant on Stanhope Street for the high-pressure water system.

CAMBRIDGE, MASS.—The Cambridge Electric Light Company contemplates the construction of a new switch house, 90 ft. x 140 ft., for handling distribution, the installation of switching and regulating apparatus and a new garage building for its cars. Welles E. Holmes is treasurer and general manager.

CONCORD, MASS.—The installation of a 500-kva. steam turbine in the municipal electric plant is under consideration and also the rebuilding of distribution lines damaged by sleet storm in November, 1921. Everett E. Pierce is manager.

LOWELL, MASS.—The Lowell Electric Light Corporation has received permission to issue $416,800 in capital stock, part of the proceeds to be used for extensions and improvements.

NORTHAMPTON, MASS.—An addition will be erected to the power house at the Dickinson Hospital.

SPRINGFIELD, MASS. — The United Electric Light Company expects to install ¾ mile of sixteen-duct underground conduit line on Berkshire Avenue, forming part of the transmission line between its No. 2 and No. 4 stations, and about 1¼ miles of overhead wires in Springfield will be placed underground. About 4,500 ft. of underground conduits, four-duct and six-duct, will be installed on Longmeadow and 10,000 ft. of four, six, eight, twelve and sixteen-duct in West Springfield. L. J. Scott is manager.

STOCKBRIDGE, MASS.—The Southern Berkshire Power & Electric Company has completed a 500-kw. hydro-electric plant at Rockdale. It contemplates several extensions and is looking over other possible watersheds with a view of developing, and also plans to install a new switchboard at its Great Barrington plant. Joseph Franz is superintendent.

Middle Atlantic States

ITHACA, N. Y.—Fred T. Ley & Company, Springfield, Mass., has been awarded a contract for the construction of a one-story power house at Cornell University.

MALONE, N. Y.—The Malone Light & Power Company will install in the village of Malone approximately sixty-five one-lamp standards mounted with lamps of 400 cp. each. This will require 26,000 ft. of park cable tested for 3,000 volts. S. G. Hunter is manager.

NEW YORK, N. Y.—The Department of Health, New York City, 505 Pearl Street, will soon take bids for the construction of a one-story power house, 50 ft. x 104 ft., at East Fifteenth Street and the East River. William E. Austin, 46 West Thirty-fourth Street, is architect.

NEW YORK, N. Y.—Bids will be received by the New York Central Railroad Company until April 21 for motors, controls and other equipment for line service. C. S. White, 466 Lexington Avenue, is purchasing agent.

NEW YORK, N. Y.—The Granby Consolidated Mining, Smelting & Power Company, 25 Broad Street, contemplates the erection of a hydro-electric generating plant at its properties in British Columbia, to cost about $400,000.

SYRACUSE, N. Y.—The Department of Public Works is preparing plans for the construction of an electrically operated pumping plant at the municipal garbage reduction works.

SOUTH AMBOY, N. J.—The Council is considering the establishment of a municipal electric power plant in connection with the present waterworks plant.

ASHLEY, PA.—The Pennsylvania Power & Light Company, Wilkes-Barre, will build a new substation at Ashley Plane for service in this section.

BOOTHWYN, PA.—The Delaware County Electric Company, Chester, will extend its transmission line from Linwood to Boothwyn and install a distributing system here.

HUMMELSTOWN, PA.—The Hummelstown Water & Power Company is planning to rebuild its power house, destroyed by fire April 5. The loss is estimated at $60,000.

NEWTON, PA.—Work will soon commence on the erection of a one-story power house at the Dunwoody Home at Newton. Clarence H. Brazer, Chester, is architect.

NORRISTOWN, PA.—The United Gas Improvement Company, Philadelphia, Pa., has completed plans for the erection of a new electric power plant at Norristown.

PHILADELPHIA, PA.—Bids will be received by Horace V. MacFadyom, acting purchasing agent, City Hall, until April 20 for a quantity of copper wire. (Contract—Class 180.)

SHARON, PA.—The Pennsylvania-Ohio Electric Company has issued $1,950,000 in bonds, part of the proceeds to be used for extensions and improvements.

YORK HAVEN, PA.—The York Haven Water & Power Company has been acquired by W. S. Barstow & Company, 50 Pine Street, New York, and will be merged with the Metropolitan Edison Company, Reading, and extensions and improvements made in the system. The Edison company has issued $4,550,000 in bonds, part of the proceeds to be used in connection with the consolidation and for extensions at Reading.

BALTIMORE, MD.—The board of directors, Union Memorial Hospital, will build a power house in connection with a new hospital at Thirty-third and Berkeley Streets, to cost about $1,000,000. Joseph E. Sperry, Calvert Building, is architect, and Charles L. Reeder, 916 North Charles Street, engineer.

LEITERSBURG, MD.—The Waynesboro Electric Company, Waynesboro, will extend its transmission line from Ringgold to Leitersburg and install a local distributing system. The company will also build a new line to Smithsburg, Pa.

HUNTINGTON, W. VA. — The Council contemplates extensions to the street-lighting system in different parts of the city, to cost approximately $60,000.

North Central States

BESSEMER, MICH. — The Ironwood & Bessemer Railway & Light Company has been granted permission by the Public Utilities Commission to issue $233,000 in capital stock, the proceeds to be used for extensions and improvements.

GRAND RAPIDS, MICH.—The United Light & Railways Company has issued $7,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

HINSDALE, MICH.—The Village Board is planning to change the municipal electric lighting system from 1,100 volts to 2,300 volts during the coming summer. George H. Williams is village clerk.

LANSING, MICH.—The Board of Electric Light & Water Commissioners has approved plans for the installation of a new street-lighting system on several streets in the city. Extensions will be made in the present system on Warner and Sunset Streets.

MONTGOMERY, MICH.—The Economy Electric Company will erect 3 miles of transmission lines and may possibly build 27 miles more. S. P. Hull is manager.

ASHTABULA, OHIO. — Extensions are being made to the municipal electric light plant, including an addition to power house, the installation of two 5,000-kw. turbines and two 650-hp. boilers. Contracts have all been let and the work is well under way. A. B. C. Palmer is general superintendent.

DAYTON, OHIO.—The Dayton Light & Power Company has completed plans for the erection of a new power plant.

HAMILTON, OHIO.—Surveys are now being made for the purpose of preparing estimates of the cost of a complete new municipal electric light plant, which will include a new water plant. James O'Toole is superintendent of electrical department.

MARSHALLVILLE, OHIO.—The Council will take new bids at once for the construction of a transmission line for local power service. Former bids were rejected. The R. M. Mead Company, Shelby, Ohio, is engineer.

SABINA, OHIO.—The installation of two 150-hp. boilers in the municipal electric light plant is under consideration; also some power transformers. J. C. Phelps is superintendent.

BLOOMFIELD, KY. — The Bloomfield Utilities expects to change its system to alternating current with auto transformer for 110-volt service within the next two months, and will also install all new induction meters in place of the present commutator type now in use. As soon as alternating current is available it expects to erect lines into the farming district. Harry Peet, Jr., is manager.

LIVERMORE, KY.—The Public Service Company is erecting an electric transmission line to Island.

STURGIS, KY.—The Bell Coal & Navigation Company, contemplates the construction of an electric power plant at its local coal properties. William Herbert is head.

EVANSVILLE, IND.—The Southern Indiana Gas & Electric Company has completed plans for an addition to its power plant, to cost about $500,000, including equipment. Frank J. Haas is general manager.

NEWCASTLE, IND.—The City Council is considering the installation of a new ornamental lighting system in the business district, consisting of 150 single-lamp standards. W. L. Younce is superintendent.

PORTLAND, IND.—The installation of two boilers of 365 hp. each in the municipal electric light plant is under consideration. L. V. Paddock is manager.

ROCHESTER, IND.—The United Public Service Company is considering the purchase of energy or the installation of a 500-kw. engine-driven generator. Charles A. Davis is treasurer.

SOUTH BEND, IND.—The Studebaker Corporation plans the construction of an electric power plant at its works, to cost about $750,000.

CAMBRIA, ILL.—The Cambria Light, Heat & Power Company contemplates extending its transmission line to Blairsville this spring, a distance of about 3 miles. J. J. Thomas is president.

CHICAGO, ILL. — The Commonwealth Edison Company, 72 West Adams Street, is preparing plans for two additional units of 90,000 hp. each at its generating plant at One Hundredth Street and the Calumet River. One of the units will be built at once at a cost of about $7,000,000. Marshall & Fox, 721 North Michigan Avenue, are architects.

EAST ST. LOUIS, ILL.—The East St. Louis & Suburban Railway Company contemplates extensions and improvements to its electric power plant and system, to cost about $500,000, of which $100,000 will be used in the Alton section.

MATTOON, ILL.—The Central Illinois Public Service Company has awarded a contract to the Adams Construction Company, 217 Clarkson Court, Chicago, for the construction of a one-story addition, 83 ft. x 110 ft., to its power plant at Harrisburg, Ill. Sargent & Lundy, 72 West Adams Street, Chicago, are engineers.

PERU, ILL. — Extensions are contemplated to the municipal electric light plant, including the installation of a 450-kva. General Electric generator and an Ames "Uniflow" engine, to replace a 200-kw. generator and engine. One 90-kw., 230-volt direct-current to 2,300-volt alternating-current motor-generator set will also be purchased. H. J. Mueller is superintendent.

STONINGTON, ILL.—The Council contemplates extending the municipal electric system to mine No. 21 of the Peabody Coal Company to furnish electricity for lighting and power. O. W. Culbertson is manager.

WHITEHALL, ILL. — Plans are being prepared for extensions and improvements to the municipal light plant, to cost about $75,000. The Caldwell Engineering Company, Jacksonville, is engineer.

WINNETKA, ILL.—The installation of two 400-hp. water-tube boilers, and chain-grate stokers in the municipal electric light plant is under consideration. H. L. Woolhiser is manager.

APPLETON, WIS.—The White Rapids Paper Company, recently organized with a capital stock of $200,000, plans to develop a water-power site on the Wolf River at White Rapids and erect a paper and pulp mill. T. Eugene Orbison, consulting engineer, and J. C. Lymer, both of Appleton, are interested in the project.

COLBY, WIS. — The Midland Public Service Company contemplates three-phasing about 20 miles of transmission lines and extensions in the farming district. F. A. Vaughn is president and manager.

EAU CLAIRE, WIS. — The Wisconsin-Minnesota Light & Power Company will construct a hydro-electric plant on the Chippewa River, to cost $1,900,000.

MILWAUKEE, WIS. — The Milwaukee Electric Railway & Light Company has appropriated $6,000,000 for extensions and improvements in its power plant and lines during the present year.

CLARKFIELD, MINN.—The Council will take bids at once, it is understood, for the construction of an electric distributing system, to cost about $25,000. The C. L. Pillsbury Company, 1,200 Second Avenue, South, Minneapolis, Minn., is engineer.

ST. PAUL, MINN.—The Council will install an ornamental street-lighting system on Wabasha Street and Central Avenue.

BETTENDORF, IOWA.—The Bettendorf Improvement Company contemplates extensions to its transmission lines, to cost about $2,000. W. Z. Schneider is manager.

CANTRIL, IOWA. — The Cantril Telephone & Electric Light Company will erect a high-tension line, 6 miles long, to connect with the system at Bloomfield. Material for the proposed line has been ordered. George W. Irvin is manager.

DUBUQUE, IOWA. — The Globe Portland Cement Company, 416 McKnight Building, Minneapolis, will build a power plant in connection with its new local cement mill. The entire works will cost about $1,500,000. The C. L. Pillsbury Company, 1,200 Second Avenue, South, Minneapolis, is engineer.

DUNKERTON, IOWA.—The Dunkerton Light & Power Company contemplates small extension on town line and may erect a few miles of farm lines. H. L. Bellmer is owner.

NORA SPRINGS, IOWA. — The Nora Springs Light & Power Company is erecting electric lines into the farming district and may possibly extend its lines into other rural sections. C. A. Coon is president.

PRESTON, IOWA.—The Rural Power Company is planning to connect 40 miles of its lines on three-phase current and erecting 50 miles of single-phase farm lines. The company also contemplates extending its lines into Andover, Almont, Teeds Grove, Green Island and other towns.

STOCKPORT, IOWA.—Plans are under consideration by the Van Buren Light & Power Company for extending its transmission line south of Donnellson into northeastern Missouri to furnish electrical service to eleven towns and one northwest from Donnellson into southeastern Iowa to serve about twenty towns in that section. Wherever possible it will supply service to farmers along the lines. Dan Roods, Kansas City, Mo., is treasurer and manager.

CLINTON, MO. — The Green Light & Power Company plans the construction of a new power plant in Clinton, to cost about $125,000. A distributing system will be installed for service in this district.

NEW FRANKLIN, MO. — The Home Electric & Ice Company is planning to build a new power house at once and installing new equipment. Its present equipment was recently damaged by fire. G. Y. Prigmore is secretary and manager.

ST. CHARLES, MO.—The special election called to vote on the proposal to issue $175,000 in bonds for a municipal power plant has been postponed.

SARCOXIE, MO.—The Southwest Electric Light & Mill Company contemplates some line repairs and lightning protection and possibly the installation of a larger engine. Art. Adams is manager.

STE. GENEVIEVE, MO. — The Home Light & Water Company is installing a 240-kva. General Electric, three-phase, 2,200-volt generating unit and two 300-hp. water-tube boilers. Guy E. Paxton is manager.

VERSAILLES, MO. — W. R. Banks, Lamar, Mo., and associates have been granted permission by the Fedederal Power Commission to construct a hydro-electric plant on the Osage River at Devil's Elbow, near Versailles. The cost of the project complete is estimated at $3,500,000.

PANAMA, NEB.—The Council is having plans prepared for an electric distributing system, to cost about $10,000. The Hollister Engineering Company, 517 Bankers' Life Building, Lincoln, is engineer.

ABILENE, KAN.—The Rocky Ford Milling & Power Company contemplates the installation of a 1,000-hp. Stirling boiler, the erection of a smokestack, 200 ft. x 13 ft., remodeling part of the power station, and will probably erect about 100 miles of transmission lines. Arthur Groesbeck is division superintendent.

CHANUTE, KAN.—Extensions are contemplated to the municipal electric light plant, which may possibly include the installation of a 100-kw. oil-engine driven generating unit and a water-softening plant. D. A. Steiner is superintendent.

HUMBOLDT, KAN. — The Humboldt Light & Power Company is building a dam at Neosho Falls and is installing two 200-hp. water turbines with generators. I. C. Bushong is vice-president.

HURON, KAN.—Extensions are contemplated to the municipal lighting system, including the erection of 1½ miles of 2,200-volt transmission line equipped with one step-up transformer, 220/2,200 volts, and three or four 2,200/110-volt step-down transformers. W. E. English is superintendent.

LARNED, KAN.—The Pawnee Power & Water Company contemplates the erection of 40 miles of 33,000-volt transmission line. H. W. Mogruder is manager.

OLPE, KAN.—Plans are being prepared for the construction of a transmission line to Emporia, Kan., for service at Olpe.

Southern States

OLD FORT, N. C. — The White Coal Power Company is planning to build a 200-hp. hydro-electric plant in Old Fort. Contract for generator and turbine has been placed. D. W. Adams is president.

PLYMOUTH, N. C.—The installation of an additional generating unit in the municipal electric plant in the near future is under consideration. R. L. Owens is manager.

POLLOCKSVILLE, N. C. — The Town Commission contemplates the installation of an electric lighting system on the principal streets.

LAURENS, S. C. — The Reedy River Power Company, which operates two plants on the Reedy River, is building a power house in Laurens, to be used as an emergency plant.

ATLANTA, GA. — The L. W. Rogers Realty & Trust Company contemplates the installation of an electric lighting system on a tract of land near the city to be developed. B. R. Padgett is general manager.

DALTON, GA.—The Georgia Railway & Power Company contemplates the construction of a new substation, to cost about $25,000.

SPARTA, GA.—The Council is considering equipping the municipal pumping station for electrical operation. R. J. Wilson is superintendent.

GAINESVILLE, FLA.—Improvements are contemplated to the municipal electric light plant, including the installation of a 500-kw. turbine, for which contract has already been awarded. G. H. Cairns is city manager.

HOMESTEAD, FLA.—Plans are under consideration to double the output of the municipal electric light plant within the next eight months. George T. E. Fuller is chief engineer.

ORLANDO, FLA.—The Orlando Water & Light Company contemplates construction of a new generating plant near Orlando, to cost about $1,000,000. Transmission lines will be erected to Winter Park, Oakland and other points. D. A. Cheney is general manager.

ST. PETERSBURG, FLA. — The City Commission contemplates extensions to the ornamental street-lighting system.

DOTHAN, ALA.—Extensions are contemplated to the municipal electric light plant within the next three months, including the installation of a 1,000-kw., 2,300-volt, three-phase, 60-cycle turbo-generator and stokers for boilers of the overfeed type. Actual work on the proposed municipal hydro-electric plant will begin late in the summer or early in the fall. R. J. Goodwin is superintendent.

FLORENCE, ALA. — The Council has authorized plans to be prepared for a municipal electric plant. Thomas Hallman is engineer.

THORSBY, ALA. — The Council has granted a franchise to P. G. Ault, Birmingham, and associates, to install and operate an electric light and power system in Thorsby.

VALLEY HEAD, ALA.—The Fort Payne Light & Power Company, Fort Payne, Ala., contemplates the construction of a transmission line from Fort Payne to Valley Head.

UTICA, MISS.—The Council has authorized plans to be prepared for an electric light and power system, for which bonds have been voted.

ARKADELPHIA, ARK.—The Arkansas Light & Power Company has contracted with the Aluminum Company of America for electricity for its plant at Bauxite, and will construct a 60,000-volt transmission line to the site, a distance of about 55 miles.

LITTLE ROCK, ARK.—The Caddo River Power & Irrigation Company has surveys under way for the construction of a hydro-electric power plant on the Ouachita River, to develop an ultimate capacity of about 60,000 hp.

MENA, ARK.—The Commonwealth Public Service Company will install new equipment at its local plant to replace apparatus recently destroyed by fire.

MORRILLTON, ARK.—The Council contemplates the installation of an ornamental street-lighting system in the business section, comprising about seventy lamps.

HOUMA, LA.—At an election held recently bonds to the amount of $200,000 were voted for a municipal electric plant and waterworks.

WELEETKA, OKLA.—Bids will be received by the Council until April 18 for the construction of a municipal power plant and distributing system, and also an electrically operated pumping station and filter plant, to cost about $215,000. V. V. Long & Company, 1,300 Colcord Building, Oklahoma City, are engineers.

AUSTIN, TEX. — The Texas Power & Light Company has made a proposition to the City Council for the purchase of the municipal power plant and system. If acquired, the company will make extensions and improvements.

LONGVIEW, TEX. — The City Council has engaged an engineer to prepare estimates of cost of the installation of a municipal electric light plant.

MILFORD, TEX.—The board of directors of the Texas Presbyterian College for Women plans to rebuild the power house at the institution which was damaged by fire March 22.

Pacific and Mountain States

HERMOSA BEACH, CAL.—Steps have been taken by the Chamber of Commerce for the installation of an ornamental street-lighting system on Pier Avenue.

LOS ANGELES, CAL.—Bids will be received by the Public Service Commission, City Hall, until May 2 for furnishing synchronous condenser equipment for the municipal power system. James P. Vroman is secretary.

ORLAND, CAL.—The Chamber of Commerce is negotiating with the Pacific Gas & Electric Company for the installation of an ornamental street-lighting system in the business district. E. A. Kirk is secretary.

REDDING, CAL.—The Pit River Power Company has preliminary plans in progress for the construction of a new hydro-electric plant in this section.

SACRAMENTO, CAL.—The Carmichael Colony Lighting District, recently organized, has issued $45,000 in bonds for the installation of an ornamental lighting system.

SAN BERNARDINO, CAL.—The Council has authorized the city engineer to secure estimates of cost for the installation of an ornamental lighting system on E Street from Mill Street to Highland Avenue. The plans call for about 300 lamps.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 2, for 102,000 ft. of portable electric cord, for use at the Mare Island Navy Yard. (Schedule 9578.)

SIERRA MADRE, CAL.—The Council will install a street-lighting system on West Central Avenue. G. T. Farman is chairman of the lighting committee.

FLORENCE, ARIZ. — The Salt River Valley Water Users' Association contemplates the construction of dams and hydro-electric plants at Morman Flat, Indian Bend and at other points, to develop a total of 40,000 hp., to supplement the present 25,000-hp. plant at the Roosevelt dam. The electric transmission system will be extended to Florence, Hayden, Ray, Tucson, Cass, Grande and other points.

PHOENIX, ARIZ.—The Auxiliary Eastern Canal Irrigation District will build a large electrically operated pumping plant to include four pumping units, for its proposed irrigation project in the Salt River district. A series of smaller motor-driven pumping plants will also be erected. Howard S. Reed and Sheldon K. Baker, 419-20 Fleming Building, Phoenix, are engineers.